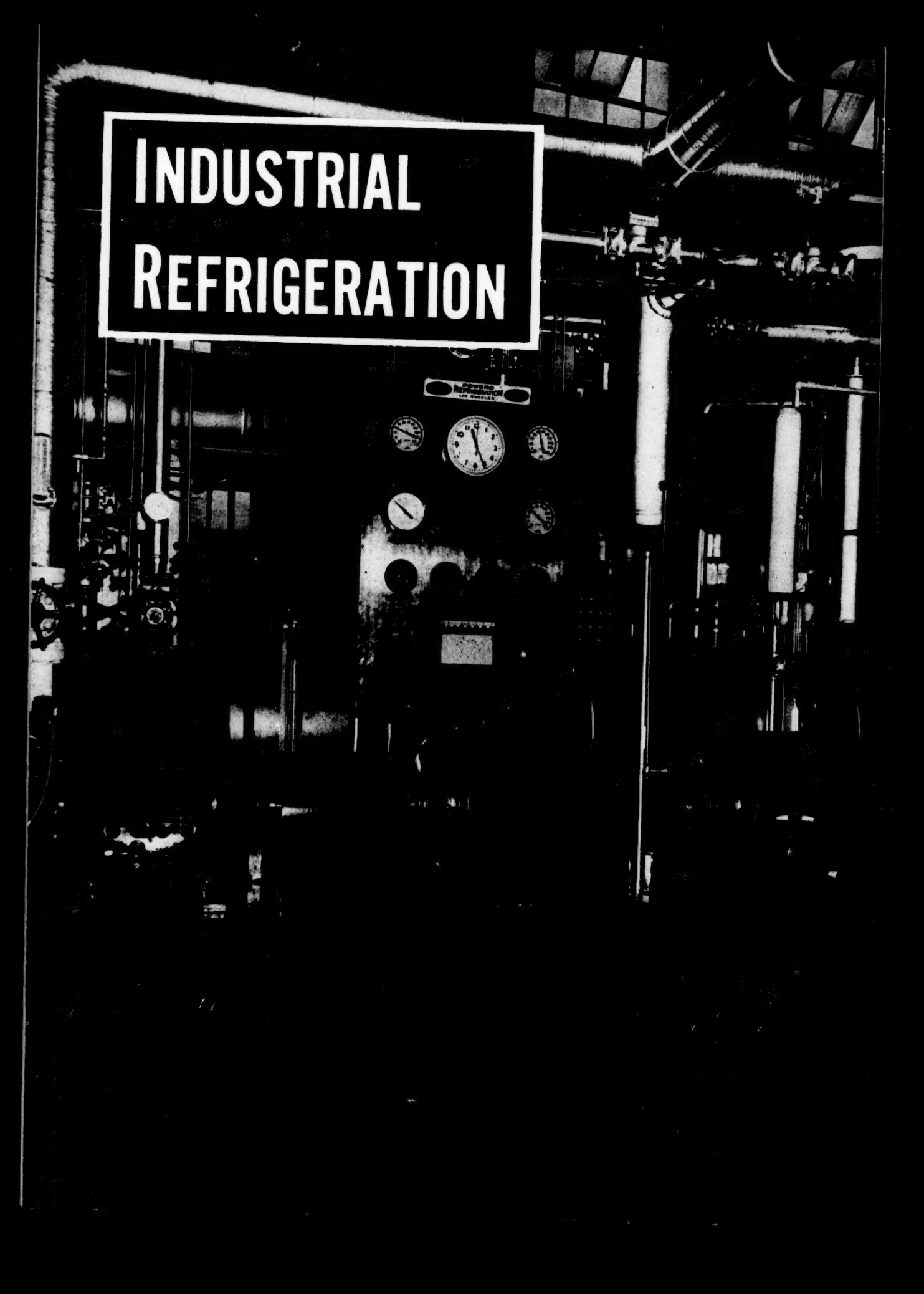
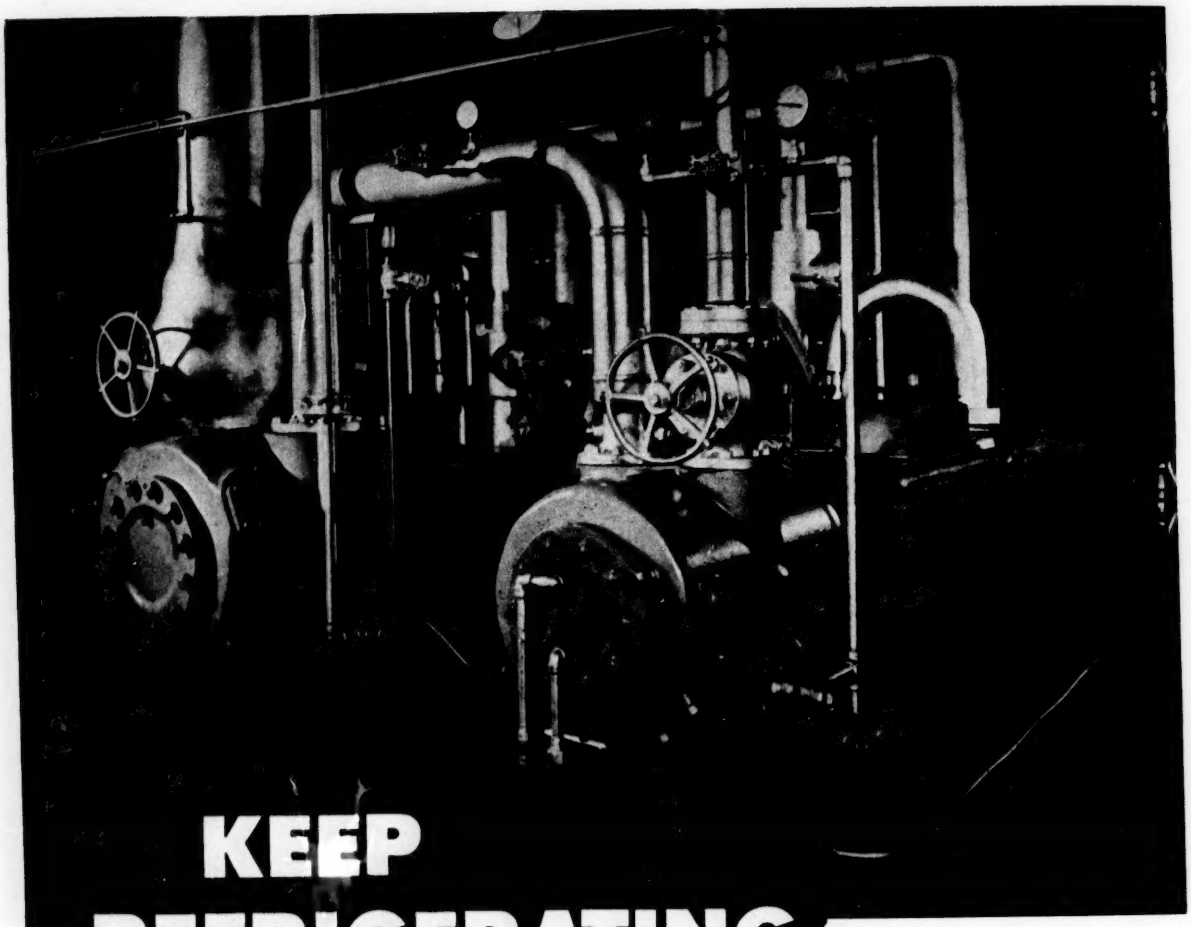

INDUSTRIAL
REFRIGERATION



KEEP REFRIGERATING SYSTEMS WAXFREE

EVEN DOWN TO minus 100° F., wax won't precipitate in refrigerating systems when you lubricate compressors with *Texaco Capella Oil (Waxfree)*. For both normal refrigeration and ultra-low temperature service, *Texaco Capella Oil (Waxfree)* assures clean, efficient operation and low maintenance costs.

In addition to its notably low haze and floc temperatures, *Texaco Capella Oil (Waxfree)* offers exceptional resistance to oxidation and freedom from moisture. It will not react with refrigerants.

There is a complete line of *Texaco Capella Oils (Waxfree)* to meet the requirements of all compressors and operating conditions. They come refinery-sealed in 55-gallon drums, and 5-gallon, 1-gallon, and popular grades in 1-quart cans.

Let a Texaco Lubrication Engineer help you get more tons of refrigeration per dollar. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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TEXACO Capella Oils (Waxfree)

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"Butcher Boy"

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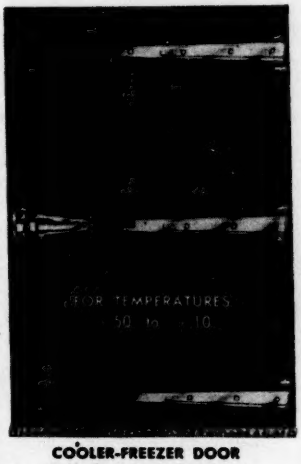
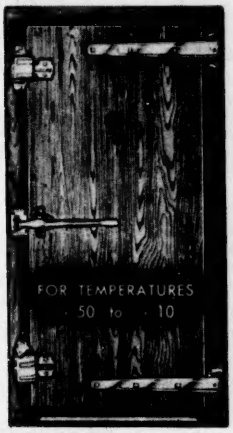
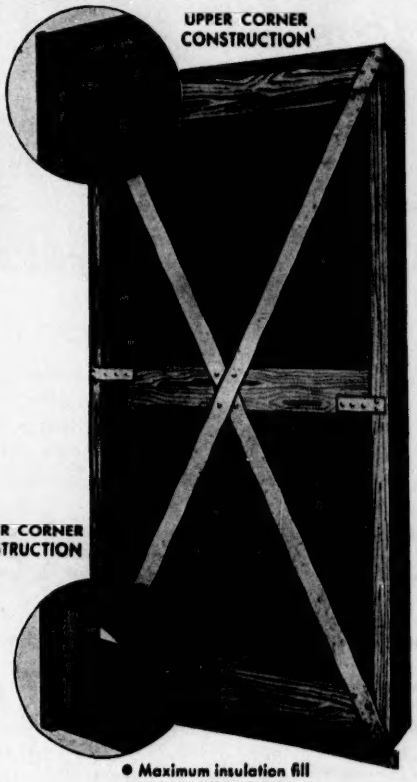


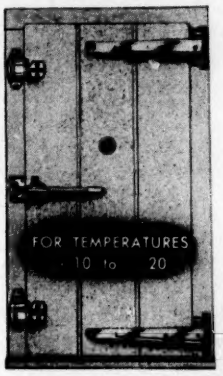
COOLER-FREEZER DOOR
- Modern streamlined job
- 100% "Douglas Fir"
- Sanitary hardware



X-52 PLYWOOD PANEL DOOR
- Plywood front and back
- Extra heavy-duty hardware
- Special type gaskets

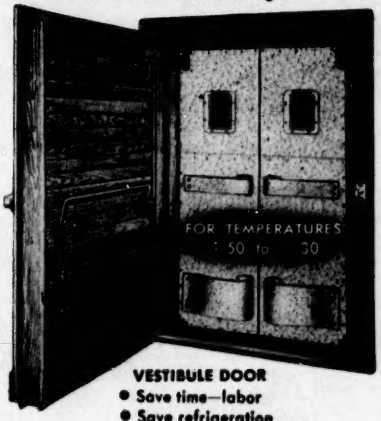


- Maximum insulation fill
- Most possible rigidity
- Allows reversal of swing



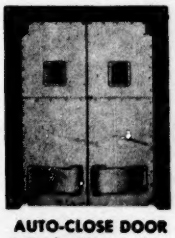
LOW TEMPERATURE DOOR
- Entire metal-clad front
- Extra heavy-duty hardware
- Special type gaskets

SUPER FREEZER (OVER-LAP) DOOR
- Extra-heavy construction
- Extra-heavy duty gaskets
- Extra heavy-duty hardware

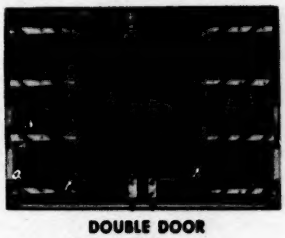


VESTIBULE DOOR
- Save time—labor
- Save refrigeration
- Large plant operation

TRACK DOOR
- For abattoirs
- Meat handling rails
- Banana rooms



AUTO-CLOSE DOOR
- For loading dock
- Intra-cooler doors
- Heavy trucking



DOUBLE DOOR
- For palletizing
- For carloading
- For elevator shafts

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the complete line

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- for brine, water, steam, air, oil
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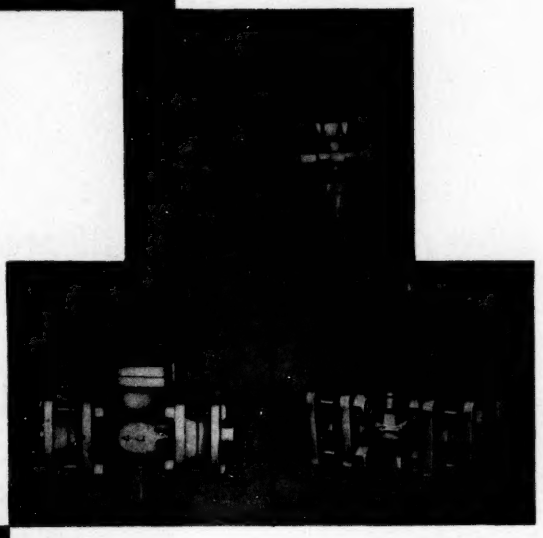

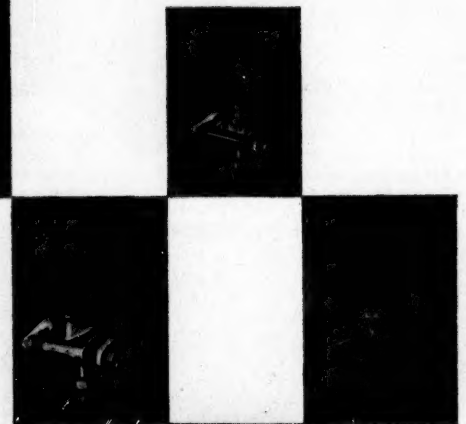

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Review of Business—1953 Forecast for 1954

AS BUSINESS and industrial concerns close their books for 1953 and start on 1954 it can be said generally that 1953 was a good year and all indications point to a continuation of that trend into 1954.

Among the high spots in the refrigerating industries during 1953 there was a huge upswing in sales of orange concentrates which depleted distributors' shelves almost to the vanishing point and brought production up to a new record. Total cold storage occupancy more than held its own, with the commodities showing increases more than making up for the decreases. The ice industry, long a victim of ruthless competition, although reporting decreased sales during 1953, is looking forward to a comeback through increased sales of processed ice and a book-keeping device by which sales will be computed on a dollar instead of a volume basis. Air conditioning equipment set new sales records and the growing trend toward its use in more residences and the nearly virgin field of automobile air conditioning presages good business in the new year. Frozen foods set new records of production in 1953 and there is good reason to believe that this momentum will continue into 1954.

Industrial air conditioning continues in expanding use. Plant managers are coming more and more to understand that it makes for lowered costs of production, better quality goods, finer and more exact tolerances, and improved morale among the workers.

The refrigerated warehousing industry had a good year in 1953 and all signs point to a continuation of this prosperity into 1954. For the immediate future, most refrigerated warehousemen expect their business to continue profitably. This is based upon a business survey completed by the National Association of Refrigerated Warehouses. Occupancy of cooler space according to 59 percent of those reporting is expected to remain the same for the next several months. Fourteen percent expect an increase and 27 percent look for a decrease. The outlook for freezer occupancy is reported particularly good, with most warehousemen expecting it to be the same or better for the next several months.

At the recent annual convention of the ice industry a merchandising program was outlined which includes a study of how best to provide what the consumer wants, how to develop new sales, and how to push sales of prepared ice.

Industrial Refrigeration

formerly ICE AND REFRIGERATION

Now in its 62nd Year of Publication

J. F. NICKERSON, FOUNDER

VOL. 126 JANUARY, 1954 NUMBER 1

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The Cover:

● *The high-stage Carrier reciprocating compressors and condensing equipment in the K & B Packing Company engine room for what is believed to be the most completely automatic refrigerating plant in the world. Behind the gauge and automatic control equipment board is the horizontal shell and the tube condenser (top) and liquid ammonia receiver (bottom). The low-stage compressors and their automatic control panel are located in the nearby Beatrice Foods Company cold storage warehouse. Similar control panels in the compressor rooms in both plants permit the automatic operation of the new Beatrice plant to be watched from the K & B engine room, where 24-hour supervision is provided, whenever no one is in attendance at Beatrice.* *Story and additional photos on page 18.*

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WING GAP VALVE
WING GAP VALVE
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4⅛" O.D.S.
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capacity. Sizes ⅜" to 2⅛" O.D.S.
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minimum pressure drop.
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No. 101 Packless and packed valves, strainers, driers, ammonia valves, check valves, relief valves, three-way valves, scale traps, liquid gauge sets, flange unions, nut unions and accessories for air conditioning and refrigeration and industrial uses.
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No. 70 Drop forged and cold rolled steel fittings.
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What's New

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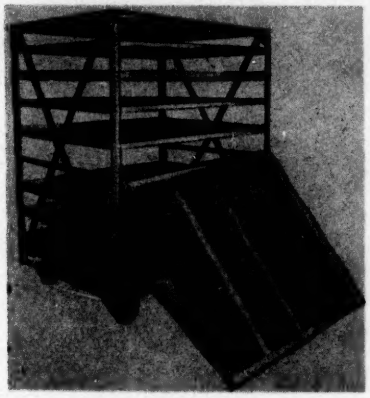
New Freezer Trucks

FREEZER trucks for loading ducks, chickens, fish for sharp freezing are now available from the Knickerbocker Stamping Co., Parkersburg, W. Va. These trucks come with ball bearing casters and cushion rubber treads. They are of welded and riveted or bolted construction and since there is no stock size or design they can be built in any size and any capacity. Freezer pans, also truck trays as shown in the illustration, are available. Posts are punched with holes to allow adjusting shelves to any desired location.

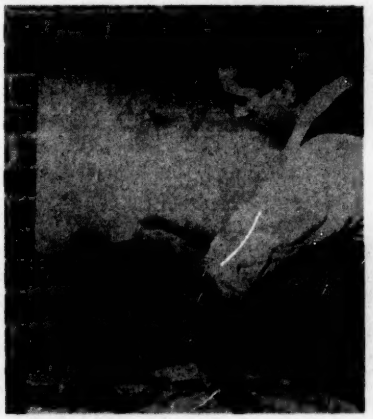


New Knickerbocker freezer truck with truck tray

Repair Damaged Galvanizing

A POWDERED metal containing flux, Farco Brand Z, developed for the particular purpose of restoring galvanized coating and repairing areas damaged by welding has been introduced by the Farrelloy Company, Philadelphia, Pa.

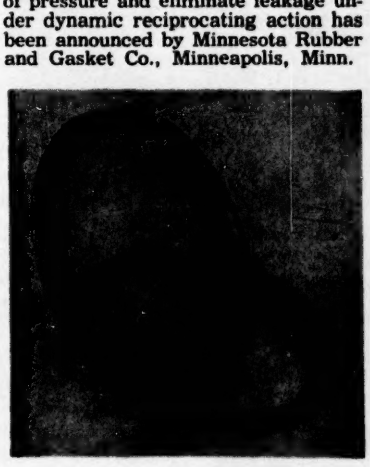
It is described as meeting Government specifications for repair of galvanized metal damaged by welding and has qualified by withstanding 800 hours in a 20 percent salt spray bath without rusting. It is claimed that it will remove the scale from black iron, penetrate rust and grease, and deposit a zinc alloy coating protecting the base metal from corrosion. It does not leave any line of demarcation but amalgamates with galvanizing. It binds more tightly than hot dipped and will not flake off. It may be applied with either torch or soldering iron depending on thickness of the metal. It will accept tin-lead solders and may be used to increase the tensile strength of these solders by increasing their adhesion on metals difficult to solder.



Applying Farco Brand Z to restore galvanized coating.

Quad Ring New Type of Industrial Gasket

A NEW type of industrial gasket, the patented Quad Ring, that, it is claimed, out-performs "O" rings in ability to resist spiral twisting, maintain a seal over greater extremes of pressure and eliminate leakage under dynamic reciprocating action has been announced by Minnesota Rubber and Gasket Co., Minneapolis, Minn.



New Patented Quad Ring

Developed in the firm's laboratories, the Quad Ring has four sealing surfaces (see illustration), compared with the two sealing surfaces of an "O" ring. It eliminates danger of the "spiral twist" effect, according to the manufacturer's laboratory reports. A common cause of failure in "O" rings, spiral twist occurs when one section of the ring rolls under pressure while the other slides, eventually fracturing the gasket. The Quad Ring resists this effect with its square cross-section and tendency to completely fill the packing groove.

These Rings are interchangeable with "O" rings, produced in a complete line of sizes and are comparable to "O" rings in wall thickness and diameter. All grooved dimensions correspond to those used for "O" ring installation. Initial applications of the new gasket have included aircraft heating duct installation, reciprocal hydraulic operations, supply hose disconnects and aircraft air storage tank seals.

Low-Temperature Chambers Offered in Standard Sizes

A LINE of low-temperature industrial chambers in five standard sizes is now offered by Tenney Engineering Inc., Newark, N. J. These sizes were selected to cover most industrial needs and to eliminate premium costs of custom built models. This is the fourth Tenney production unit to be so standardized. The others are the altitude chamber (Tenneyzphere), the humidity chamber (TH & TR series), and the dry-ice type low-temperature chamber (Servo Unit).

Low temperature cabinet designed by Tenney Engineering Company.

The Sub-Arctic chamber, using only Freon refrigerants for all temperature ranges, is available with the following standard-size work spaces: 1 cu ft. 14x12 inches; 4 cu ft. 24x18x16 inches; 6 cu ft. 24x18x24 inches; 9 cu ft. 40x22x18 inches; 12 cu ft. 40x22 x24 inches.

These chambers are designed for operation at -40, -80, -100, -120, -150, and -170F, depending upon customer requirements. The -150 and -170F models are equipped with Tenney compressors especially engineered for handling Freon in very low temperature systems.

Chambers can be equipped with program controls which automatically cycle temperatures according to pre-set patterns. The Sub-Arctic also can be designed to produce high temperatures in addition to the low temperatures. It can be equipped with air or water cooled condensers. Castor mountings are available if desired.

Skinner-Seal Valve and Bibb Reseater

THE Skinner-Seal Valve and Bibb Reseater is now available in a newly designed black and green, fitted Styrene case according to an announcement by the M. B. Skinner Company, South Bend, Ind. The new fitted case provides individual wells and grooves, with part numbers stamped in each, for every item in the kit. It is designed to house either the 2 in. size tool for ½ in., 2 in. valves and ¼ in., ¾ in. bibbs; or the 3 in. size for ½ in., 3 in. valves and ¼ in., ¾ in. bibbs. A 2 in. Skinner-Seal Valve and Bibb Reseater can be expanded to a 2½ in. to 3 in. size by ordering only those parts identified by the empty wells. This applies to ordering replacements, also.

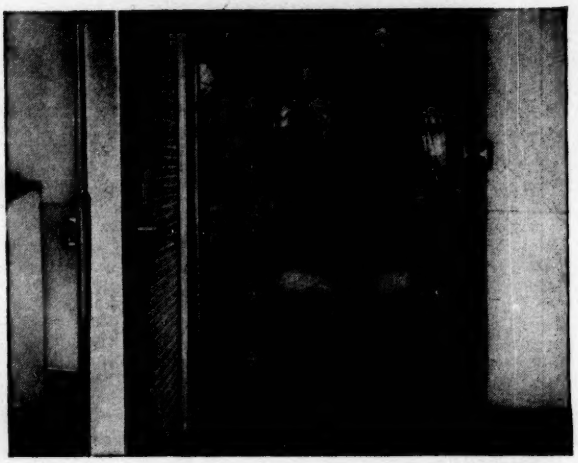
Skinner seal valve and bibb reseater.

At present prices of brass globe valves, the first two or three jobs, it is claimed, pay for the set. Bar type cutters operating under screw feed, leavé worn, scored seats glass smooth, level, absolutely tight. Low spots on the seats, grooves, uneven places, have no effect. The cutter rotates on a level plane and is advanced by slight turns of the feed screw until the job is done. The tool provides a full range of guide pilots, cutters, spindles, tapered bushings plus hand wheel and bitt brace.

Turco-Solv New Solvent

DEVELOPMENT of Turco-Solv, a quick-drying safety solvent, designed for the cleaning of electrical equipment such as wiring, fuses, motors, switches, etc., has been announced by Turco Products, Inc. Especially formulated to replace carbon tetrachloride in all cleaning operations, Turco-Solv, it is claimed, combines the least toxic solvents available, consistent with safety from fire hazard.

Cleaning a large generator with Turco-Solv.



SUPER MARKET EXPANDS USE OF CORKBOARD INSULATION

After its experience with the effectiveness of corkboard for the insulation of low-temperature spaces, Albany Public Markets, Inc., made two additional installations—one in 1951, the other in 1952. No maintenance work of any kind has been required on these installations since the erection jobs were completed by United Cork Companies' erectors.

Engineering design of the installations was worked out by the Albany branch office of United Cork Companies in cooperation with Albany Public Markets, Inc. Architect for the buildings was Edward J. Toole.

Advantages of United Cork Service

The availability of complete engineering and erection service from nearby branch offices is one of the major reasons why thousands of operators of refrigerated spaces have selected United Cork Companies' BB (Block-Baked) Corkboard as their own low-temperature insulation. Engineering staffs and erection crews are prepared to handle the entire insulation job, and to work in close cooperation with owners, architects and refrigeration contractors.

This nationwide service, which includes a thorough check on the actual performance of the installation, assures customers of the most effective use of the inherent advantages of corkboard insulation.

The type of corkboard produced by United Cork Companies is also of major importance in the effectiveness of insulation jobs. Carefully selected grades of cork are formed into corkboard by United Cork's patented process of block-baking (BB).

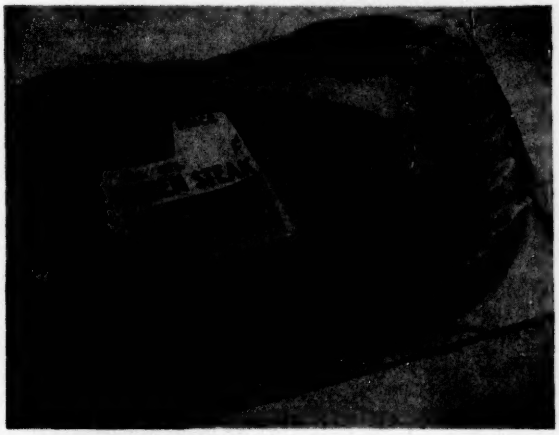
Thus United Cork Companies offers a completely integrated responsibility covering every step of the insulation job — from selection of raw materials, through manufacturing, engineering design, and erection of the insulation, to checking of performance.

For more information about the scope of United Cork Companies' service—and about the effectiveness of installations in the toughest service—just drop a line to United Cork Companies, Dept. I-6, Kearny, New Jersey.

Turco-Solv is suited to many cleaning requirements. For example, it can be used for in-plant maintenance cleaning of electrical equipment, where a high-flash material is required. It can be used on the production line to remove grease pencil, chalk, ink or hand marks from motor generator sets. It can be used in a whirl parts washer as a substitute for vapor degreasing or hand-wiping. Or, it can be used as a maintenance tool in the transportation field. It leaves no oily residues and requires no after-neutralization. It is non-corrosive and is safe for use on all metal and wood surfaces, as well as well-bonded paint. Since it is non-conductive, it can be used to clean motors while they are hot. It is applied by non-atomizing low-pressure spray or brush.

Brand Identity on Du Pont Wrapper

SUGGESTED ways packers can wrap fresh-frozen meats for the growing home freezer market without losing brand identity here featured by the Du Pont Film Department at the annual meeting of the American Meat Institute, which opened in Chicago October 2.



A fresh frozen steak in a printed polyethylene bag. A creased, cardboard stiffener, in addition to acting as a bag closure, has the packer's brand name.

By using tough, flexible polyethylene film, the Du Pont exhibit pointed out, meat packers can carry their brand names direct from retail display cabinets into home freezers, and refrigerator freezer compartments. Polyethylene packages also have this consumer advantage, no rewrapping with special materials is required before storage in the freezer.

One of the fresh-frozen packages shown was a roll-roast of beef with the packer's brand name on a printed band-label. Meat and label are protected by a polyethylene overwrap. Retailer's label, with weight and price, is on the overwrap. Another similar item, a fresh-frozen steak, is overwrapped in polyethylene film with a prominent packer-brand label.

Roller Skids

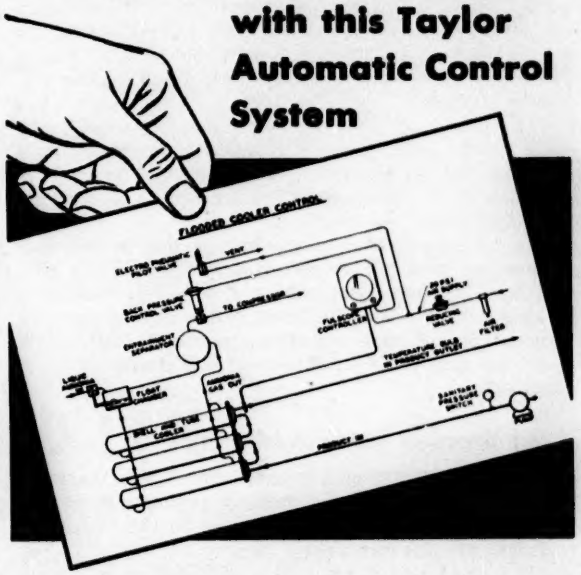
REFRIGERATION machinery installers and service personnel will be interested in the Multiton Servus Roller Skid, a catapillar action endless tread type skid for moving heavy machinery. This new type skid produced by Stokvis & Edera & Co., Inc., will support up to eighty tons and makes moving easy over cracked, roughened or uneven floors. Made of Swedish steel, the Servus comes in three sizes from ¾ to 1¼ inch roller diameter, overall specifications of 2½ inches high by 3¾ wide and 8 inches long, to 3¾ high 5 wide and 11¾ inches long, 15 to 80 tons capacity.

Illustrated loose-leaf bulletin is available.

(For additional New Equipment items, see page 53)

UNIFORM COOLING without freezeups

with this Taylor Automatic Control System



HERE'S a Taylor Automatic Control System especially designed to cut your costs by increasing efficiency at the important cooling phase of processing. Once your operator presses a start button, you're assured of constantly uniform outlet temperature—*with no possibility of freeze-ups due to flow stoppage or electrical failure.*

This Taylor Control System is applicable to both open types of cooler, like the Baudelot, or closed types of the shell and tube construction, whether brine or ammonia coolants are used.

For complete information on Taylor's full line of accurate, dependable instruments for the refrigerating industry, ask your Taylor Field Engineer, or write for **Catalog 300.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

Taylor Instruments
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ACCURACY FIRST
IN HOME AND INDUSTRY

PRESS BRIEFS

Cathode Rays Offer New Way of Food Preservation

SOME six years ago General Electric began intensive applied research on the use of cathode rays to sterilize foods and drug items. To encourage other firms and laboratories to explore applications of this new tool, they rented equipment to interested firms. One of the scientists of one of the nation's foremost food processors said recently, "the potential benefit of this cold sterilization are enormous . . . we might be close to the ideal food preservation method."

It is stated that when perfected this new advance will undoubtedly effect profound changes in present methods of processing, packaging and storing foods. The need for refrigeration or freezing may be reduced or even eliminated, according to General Electric.

The heatless method of sterilization has uncovered a tremendous potential in the preservation of many food and drug products. Meat, milk and grain are among the foods which have been sterilized. A new cathode ray laboratory has just been dedicated at General Electric. Its doors are open to potential users of cold sterilization, reports state.

Cold Storage Adds Addition

CONSTRUCTION of a $350,000 addition to the Bellingham Cold Storage plant at Bellingham, Wash., has been started. The plant is located on the Squalicum fill area, which is leased from the Port of Bellingham, on Puget Sound's Upper region. The new addition will comprise a reinforced concrete building covering a ground floor area of 148 by 237 feet, 24 feet high. The structure will adjoin the existing plant, utilizing the land on the north between the present plant and the shipyard railroad spur line.

The new addition will triple the capacity of the cold storage plant, making available space for 7000 tons of frozen foods, according to President A. W. Talbot. Already installed compressors, however, with a daily freezing capacity of 400,000 pounds are considered sufficient to handle the space of the new addition, although a battery of blowers will be added as part of the new facilities.

Ebner Files Petition in Bankruptcy

THE Ebner Ice and Cold Storage Co., Vincennes, Ind., which operates four plants in Indiana and four in Illinois has filed a voluntary petition in bankruptcy. This is one of the old established ice companies and is well known throughout the ice industry. Matthew E. Welsh, Vincennes attorney, has been appointed as receiver. Welsh has been given authority to continue operation of the company.

The company's Indiana plants are at Vincennes, the headquarters of the company; Martinsville, Seymour and Washington. The Illinois plants are located at Olney, Flora, Carmi and Vandalia.

William E. Glover of Vincennes, president of the company, said the company after several years of losses began building up its business but suffered a blow this year when the drought hit the apple crop in southern Indiana and southern Illinois. He said only about 30 percent of the fruit normally stored in Ebner warehouses was available this season.

Air Conditioning Outlook

AIR conditioning today is the most recession-proof of industries, according to Matthew M. Lawler, vice-president of Worthington Corporation's Air Conditioning and Refrigeration Division. Speaking before a gathering of Worthington air conditioning equipment distributors, Mr. Lawler outlined the company's plans for the 1954 market.

He told the distributors that in air conditioning they have a strong defense against any business declines. "In fact," he said, "even if we were to be faced with a general business recession, I would expect the volume of air conditioning business to keep right on increasing. There are even reasons to argue that a recession would have a positive effect on the sales of air conditioning systems."

Among his reasons were: sharpened competition for retail sales would spur air conditioning sales to retail stores; manufacturers will look to air conditioning to lower production costs and improve the quality of their products; competition in the housing field will be such that new homes will have to be offered fully air conditioned while rental properties will have to be air conditioned to remain rented to capacity.

In reviewing 1953 sales, Mr. Lawler revealed sales of commercial packaged air conditioners increased 60 percent over 1952. The overall sales volume for the Air Conditioning and Refrigeration Division increased 16 percent over the previous year. "We expect a 40 percent increase in our total volume of sales in the coming year," said Lawler, "with an increase of 60 percent in the sales of commercial packaged air conditioners alone."

Food Processors School

THE 33rd Annual Food Processors School of the Oregon State College Food Technology Department has been scheduled for the following dates:

Monday, January 25, 1954. Closing Machine and Double Seaming School, by American Can Co. begins. (two weeks instruction)

Wednesday, February 3, 1954. 33rd Annual Food Processor's School (one week's instruction)

Monday, February 8, 1954. Closing Machine and Double Seaming School, by Continental Can Co. begins. (two week's instruction).

The one week of lectures starting February 3 will cover the fundamentals of canning and freezing, together with talks on allied subjects. Also, for the first time, instruction will be included by two can manufacturers, Continental and American Can Companies.

Wind Traps Driver in Deep Freeze Truck

THE driver of an ice cream truck, Robert Lowry, Hagerstown, Maryland, was trapped for about 20 minutes Saturday in the refrigerated section of his truck when the wind blew the door shut. Lowry had taken an order at a nearby Smithsburg firm and went out to get the ice cream. It was in a far corner of the truck and he had to climb in to get it. The wind blew the door shut trapping Lowry. "I wasn't so cold but my lungs felt like they were going to bust. I hollered but nobody could hear me," he said. David Newman came out of the auto firm where Lowry was making the delivery to see what was keeping the driver. He opened the door and found Lowry in the truck, somewhat weakened, but apparently none the worse for his experience after inhaling some fresh air.

Large Curvette

by KRAMER

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quick and *easy* access

Praised for years by installation and service men.

Built-in Heat Exchanger

NO RUSTING — polished aluminum casing

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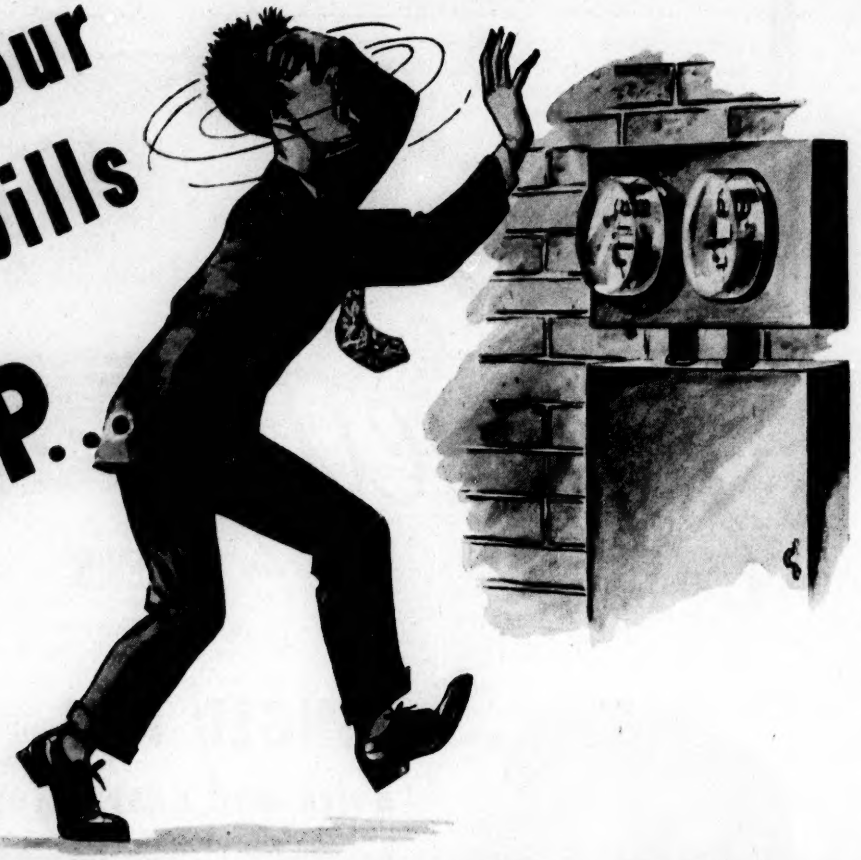

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Don't always blame the Power Company when your refrigeration operating costs begin to climb. First check the big savings advantages of Rubatex Insulation Hardboard. Its constant low heat conductivity assures positive temperature control and Rubatex installation requires as low as 53% as much power as other insulating materials to maintain low temperature. Real power savings? You bet it is!

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In the Spotlight

A COLD STORAGE facility has been constructed at Mt. Vernon, Wash., specifically designed to provide refrigerated warehouse space for a large frozen food processing plant. This new facility combines a number of construction and operating features of interest, all of which are described and illustrated in the article starting on page 13.

AN EXPANSION program has been completed by L. S. Heath & Sons, dairy products plant, Robinson, Ill., including additional refrigerating equipment, an addition to the dairy plant, and added warehouse and storage space. See page 17.

A NEW FULLY AUTOMATIC warehouse and freezing plant is now in operation in Denver, Colorado, occupied by the Beatrice Foods Company and K & B Packing Company. High pressure cutout switches regulate the temperature and operating conditions, with a minimum of supervision. This new plant is described and illustrated in article starting on page 18.

VOLUME STORERS of perishable foods sometimes are faced with the problem of whether to build their own refrigerated storage space or to use the established services of a public refrigerated warehouse. In this article the view and expressions of a number of refrigerated warehousemen, who have been in the business of storing perishable foods for many years, are compiled on this important question. It is intended to furnish facts and data which volume storers may use to help them decide whether to build or rent storage space. See page 21.

THE EIGHTH ALL-INDUSTRY Refrigeration and Air Conditioning Exposition held at Cleveland November 9-12 attracted a healthy increase over any previous show. For report and pictures see page 26.

AN ICE CREAM plant with 1,000 gallon capacity goes two-stage and automatic with incorporation of unloader equipped booster, auto-electric motor controls, and a liquid return system. See the story of Wanzers Roseland plant on page 27.

A MOBILE test unit to provide frozen food packers with in-plant research assistance has been designed and built by The Continental Can Company. For description see page 28.

COLD STORAGE holdings for November 31, as reported by the U. S. Department of Agriculture showed a decline of three points from the month before, but it was still above average for this time of year. Freezer occupancy was three percent higher than this time last year. For additional details see page 29.

THE USE OF public cooler and freezer storage space in refrigerated warehouses per month for 1953, 1952, 1951 and the five-year average is tabulated and analyzed in the article starting on page 30. In general holdings showed an increase total over last year and the five-year average. For details see page 30.

A REFRIGERATED warehouse has been enlarged at Sanger, Calif., to take care of increased frozen food needs in that section. See page 16.

THE SELECTION and operation of cooling towers and evaporative condensers is an important responsibility of the operating engineer, depending upon a number of factors in the plant. In the article starting on page 33 the needs, conditions and restrictions of a medium sized plant in this respect are discussed and analyzed.

A BUMPER California pack of frozen strawberries is expected to boost U. S. production to a record high this year according to the National Association Frozen Food Packers. NAFFP figures, exclusive of California show a total of 133,923,574 lbs. for the 1953 strawberry pack—ten percent below last year's mark.

LIQUID EGG produced in September for immediate consumption drying and freezing were about the same as a year ago. Frozen egg production during September totaled 9,465,000 pounds, compared with 9,371,000 pounds in September last year and a five-year average of 6,665,000 pounds.

RECEIPTS OF imported frozen tuna for canning in this country amounted to about 64 million pounds from January through July 1953, nearly as much as for all of 1952. Japan, a top tuna producer, is planning to step up shipments.

HOME FREEZER SPACE is being added to American housewives' food storage space at the rate of 18 million cubic feet a year, according to some recent figures. So far this year over 800,000 freezers have been sold, according to one estimate.

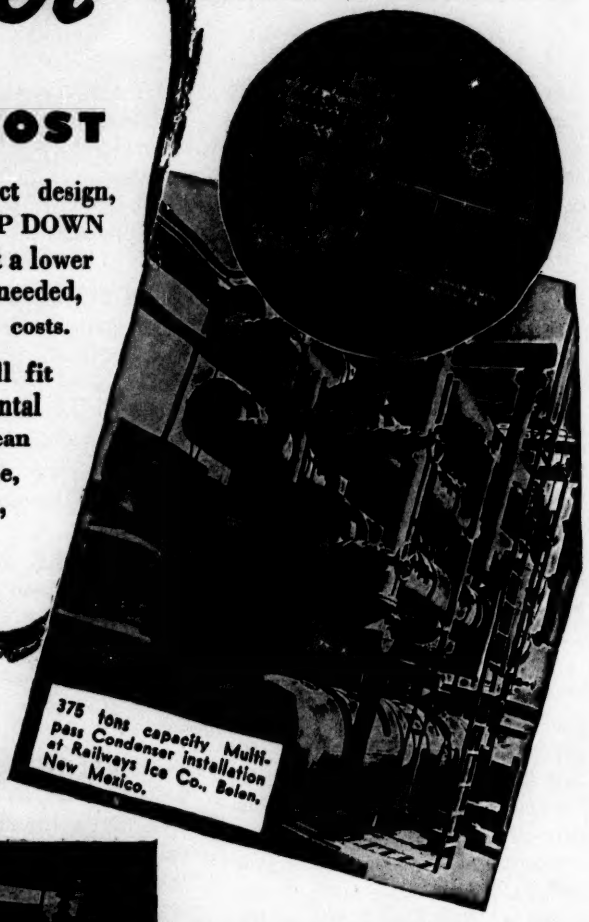
CONCENTRATORS last season used 45 percent of the Florida orange crop, an all time high over the 40 percent used the previous season, the U. S. Dept. of Agriculture reports.

$ave Power and REFRIGERATION COST

Vogt Condensers, because of their correct design, STEP UP the rate of heat transfer and STEP DOWN head pressures. With the liquid delivered at a lower temperature, smaller compressor capacity is needed, saving in original as well as operating costs.

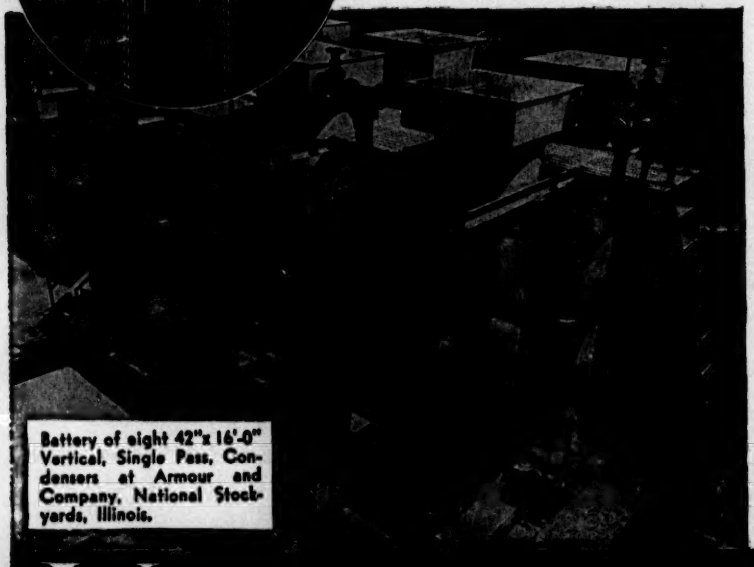
One of the two basic types illustrated will fit your operations exactly. Install Horizontal Multipass (closed type) for use with clean waters. Where the water is hard, forms scale, contains mud or promotes fungus growth, Vertical Single Pass (film type) which can be cleaned in operation, are recommended.

Horizontal Multipass Condensers
(Closed Type)
Water circulated in tubes traverses the length of the unit a number of times as determined by baffles in the heads.



375 tons capacity Multipass Condenser installation at Railways Ice Co., Belen, New Mexico.

Vertical Single Pass Condensers
(Film Type)
Patented ferrules give equal distribution of water to and over the surfaces of all tubes in a unit.



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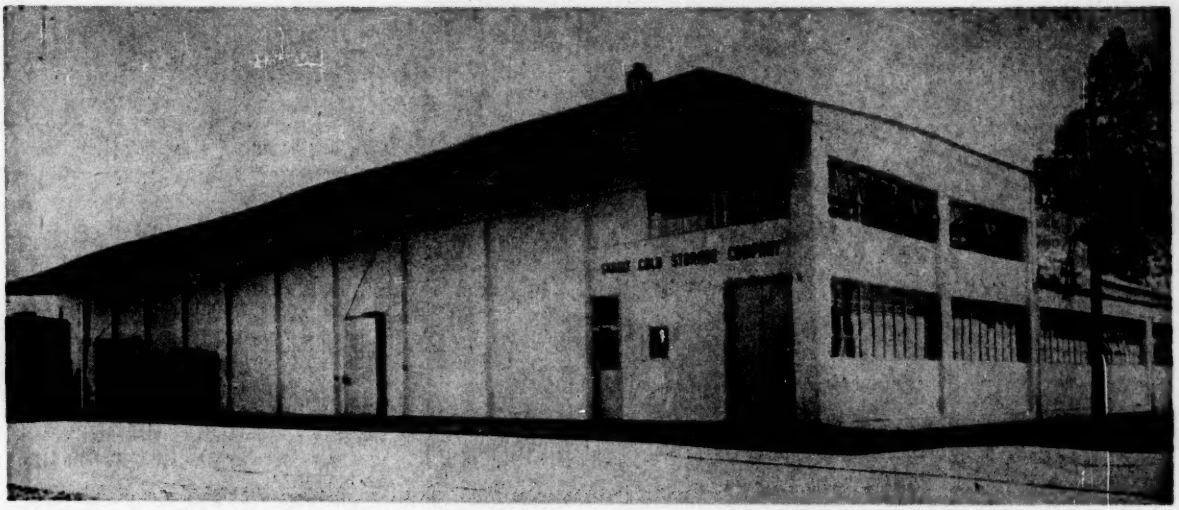


The Skagit Cold Storage Co., Mt. Vernon, Wash., has been designed for ease of palletized handling. Note the absence of a loading dock. At right end are the compressor room and office bay. The area for receiving frozen foods from the nearby Pict Sweet plant extends back of the compressor room.

New Refrigerated Warehouse Serves Rapidly Expanding Frozen Food Processing Area

New Refrigerated warehouse facility constructed to serve large frozen foods processing plant. Modern equipment is used throughout new plant to expedite flow and storage of goods.

ARCHITECTS and engineers were allowed a free hand in planning the new plant of the Skagit Cold Storage Co. in Mt. Vernon, Wash. As a result this commercial cold storage warehouse combines a number of features of interest, including floor sub-surface aeration, zone room temperature control, and diffused circulation of air.

The facilities were designed to accommodate 12,500,000 pounds of commercial cold storage and to sharp freeze up to 75 tons of fruits and vegetables daily.

Location of the plant at Mt. Vernon is another illustration of the increasing cooperation between commercial cold storage plants and the fast-growing quick-frozen foods industry. In the Northwest Washington area there are at least seven major frozen foods companies and several smaller processors, none of which have sufficient storage capacity to hold an entire year's pack.

During the 1952 season so much frozen foods were processed in this area that some of the pack had to be shipped as far away as central Washington for storage. Then, to further complicate an already critical storage situation, PictSweet Foods, Inc., decided to convert their big cannery at Mt. Vernon to a frozen foods processing plant. And they did not have any facilities of their own for cold storage in the city.

This created an opportunity for a cold storage operation in Mt. Vernon. A Seattle investment firm, the C. D. Stimson Co., headed by David Stimson, underwrote the formation of the Skagit Cold Storage Co. A contract was written with PictSweet to furnish up to 80 per cent of its storage capacity. Other frozen foods firms indicated their eagerness to use the projected facility.

Consequently it was thought desirable to locate as close to PictSweet as possible in order to reduce handling costs and also make use of a Great Northern spur extension. The best site was a tract of ground south of the PictSweet plant. This property lay between the Skagit River, and the river dike.

Sand and Gravel Fill

Studies were made to determine type of structural floor or whether to put a fill on this original ground and build on top of that. The investigation was made by Dames & Moore, soil consultants, working with engineers of the Callender Engineering Co., who designed the plant. The study showed the fill to be the most economical method.

Test borings were made on the site and sunk to 50 feet below the surface to investigate the soil and bearing loads. It was found there were two layers of clay six to eight feet in thickness at both the 25 and 40 foot levels below the original surface near the dike. These stratum were found to be smaller on the river side. In the fall of 1952 a sand and gravel fill was made over the entire property, raising the ground level an average of eight feet. Some 25,000 feet of fill material was used for this purpose.

The area near the dike where the clay stratum was thickest was surcharged with an additional ten feet

Compressor room of Skagit Cold Storage plant is York-equipped, with two each high speed V/W machines and rotary boosters.

of fill material so that the clay would be loaded to squeeze out the water and take a settlement. Measurements showed that from November to March the soil settled six inches, which coincided with the settlement curves prepared by the soil consultants.

An unusual method of aeration of the gravel subsoil to inhibit ground freezing was adopted. The air drainage system was tied into an air intake in the engine room, which draws warm air from the ceiling and with a one horsepower fan forces it through a two by three foot duct which runs under the front of the building and ties into six-inch concrete drain tiles placed on 6-foot centers. The system runs continuously all seasons of the year. This also provides good ventilation for the engine room, drawing off warm air and stray ammonia fumes, it was pointed out.

Construction of Building

The design called for a refrigerated plant 220 feet long by 140 feet wide and 20 feet in height under the trusses. The engine room section adds an additional 25 x 100 feet. The office bay, 25 x 40 feet, is above the engine room. Extending from the engine room is the 25 x 60 foot receiving area, which is located only a few feet from the PictSweet plant.

The designer, James Callender, who has prepared plans and specifications for many cold storage plants in the northwest, called for a plant which is built on track level rather than dock height. The concrete slab which forms the floor of the plant is on the approximate level of the Great Northern spur track in front of the plant.

The walls are of reinforced concrete. Tilt-up construction, a technique which has rapidly become popular in the West, was decided upon because of the economy of this building method. The wall slabs, 18 feet wide and 20 feet high, were poured on the floor slab, allowed to cure, and then hoisted into their final position in the wall, and temporarily braced. Then the wall columns were poured in place, thus tying the wall panels together and forming bearing for the roof trusses. The wood trusses are of glued, laminated construction with a system of carrying-trusses, making six interior columns in the entire refrigerated plant. A double bow string truss is employed with one center line of columns. The ceiling is suspended from the trusses. The roof is painted with aluminum to reduce absorption of solar heat.

Insulation

The cold storage warehouse is insulated with 15 inches of rockwool in the ceiling and six inches of Armstrong corkboard insulation in the floors and on the walls. Concrete was first coated with an asphalt primer to seal all the pores and then each cork sheet was dipped into hot asphalt and then erected. Brownskin paper was used as the vapor barrier below the rockwool insulation in the ceiling. This was the standard membrane with two layers of paper and a layer of asphalt between. The joints of the paper were stapled together and then cemented with an asphaltic compound. The Brownskin membrane was made continuous with the vapor barrier at the corkboard, to envelope the cold area.

Doors in the refrigerated room are Jamison equipped, with AirLec operators. They are single hung six feet wide by 10 feet high. The tunnel doors also are Jamison make.

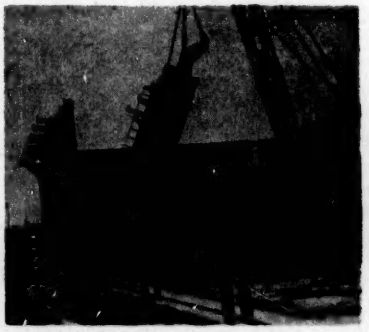
Refrigeration Equipment

A York-equipped refrigeration system was engineered by M. R. Overbye, Seattle branch manager, York Corporation. The compressor room is based on high speed design. Consequently no massive foundations were installed, and the compressor bases are more in the nature of leveling pads.

As shown in picture of the compressor room the intercooler is located near the center of the room. At the far end of the compressor room (not shown) are two York 20-inch diameter by 16-foot shell and tube condensers, and a 36-inch diameter by 16-foot ammonia receiver. The unit coolers are located on the other side of the wall separating the compressor room from the cold storage room, so there is only a short pass between the machines and the evaporators with resulting high efficiency.

The plant runs on two-stage compression during peak periods, and single stage compression during the holding period. Of the four machines, two have synchronous motors, enabling power factor to be kept high to avoid any penalties. The two 16-cylinder 3¾ by Finch V/W compressors have 125-hp synchronous motors. The two rotary boosters, one a York model 15C and the other a York 13D are equipped with 125 hp and 100 hp induction motors respectively.

Instruments include an Alnor 16-point selective distant-reading ther-



New tilt-up method of concrete construction was used for Skagit Cold Storage plant. Wall slabs were poured on the floor, then hoisted into position and tied with wall columns.

Clark fork lift in background is pallet-stacking bulk-frozen peas. Note diffuser in ceiling above truck. Air conditioning type diffusers were used throughout for air distribution.

These six freezing cells handle supplementary sharp-freezing. The small doors above the Jamison tunnel doors may be opened to force cold air into the ante room for room freezing.

mometer installed in the compressor room. Four thermo-couples are located in the ground under the subfloor, to ascertain soil temperatures.

In the storage room two bulbs are located near the center and on each wall, located half-way between the ceiling and the floor. Other bulbs are placed in the cold storage room and freezing tunnel. In the freezing tunnel one bulb indicates the temperature of air leaving the freezing coil and another bulb is placed to determine the temperature of the air returning to the coil from the tunnel.

Zone Room Controls

The main warehouse room has been engineered as if it were four different areas, and is equipped with four York IDV type unit coolers. The two units at the extremes of the room deliver 18,000 cfm each, while the two central units are rated at 12,000 cfm capacity. The units are zoned with individual thermostats and liquid solenoid valves to compensate for the loads in their respective parts of the building. Each unit operates individually. One unit, or four units, or any combination may be found working at any one time as the temperature varies within the vast storage space. George Hardy, manager, Skagit Cold Storage Co., reported that the system is working out quite well and a temperature of approximately minus 5 F is maintained throughout.

Air conditioning type diffusers, mounted on the ceiling, are used for distribution from the unit coolers. The ductwork is run above the finished ceiling, and is sized according to the pressure requirements. There are four Tuttle & Bailey Aerofuse ceiling grilles in the ductwork from each unit. This method of distributing air is another innovation at the Mt. Vernon plant that is working out very well. This type of air distribution approaches very closely the gravity movements of a pipe coil installation.

As a result of the clear interior design, the product can be piled practically to the light globes with little waste space. Provision for ample circulation of air has been made by the installation of permanent wall racks throughout the room (which construction also protects the unfinished insulation). This prevents stacking of frozen products directly against the outer walls thereby cutting off circulation of air.

Palletizing Throughout

The Skatgit Cold Storage Co. plant was planned for the maximum ease of operation. All storage is palletized. Clark electric fork lift trucks, 2000 pounds capacity each, are used for handling. The management reports that the use of the fork lifts has been so efficient that earlier plans for a power conveyor between the nearby PictSweet plant and the Skagit plant has been abandoned for the time being.

The product is palletized after being tunnel frozen and cased at the PictSweet plant. The PictSweet fork lift trucks deliver the pallet loads directly to the handling area of the

Air from the engine room is vented from these outlets after it has been forced through a ventilation system in the subsoil.

Warm air from engine room is delivered to subsoil vent system through 18-inch duct by 1 hp axial vane blower in center background.

Skagit Cold Storage, where the loads are transferred to the Skagit trucks and are moved through airlocks directly to cold storage.

Quick Freezing Equipment

The Skagit Cold Storage Co. plant has six freezing tunnel cells, which can be individually operated for any variety of product. The cells can be loaded or unloaded at either end. The product may be put through the tunnels on carts, pallets, or any convenient method.

The freezing tunnels were designed to sharp freeze 50 tons per day. Bulk freezing can also be done in the anteroom by opening up air circulation ducts, and about 25 tons daily may be additionally frozen by this method.

The equipment which supplies blast cold air to the six cells is located in a chamber above the tunnel. In the center of this chamber is installed a York dry spiral-fin coil (water defrost). It is fed from a liquid ammonia recirculation system, and was custom-built by York for the job. Ammonia temperature is minus 40 F; air minus 20 F.

Air passing through this coil is forced into one end of each freezing cell by Buffalo axial flow blowers. There is one blower mounted in the ceiling of each cell. The air, thus forced from the chamber above, passes through the length of each cell, and returns to the chamber above through openings approximately 3x4 feet at the opposite end of the cell, where it passes through the coil for recirculation.

Future Plans

During the past season the new plant was utilized to capacity by the nearby frozen foods plants, PictSweet and others. In addition to storage, the plant was called upon to freeze a large quantity of strawberries, peas, and corn as heavy production of these field crops swamped the capacity of other quick freezing firms in that vicinity during the peak of the season.

Property has been acquired, filled and graded for construction of another storage unit the same size as an extension of the present plant if frozen food production in the area continues at the same high level.

Since the Mt. Vernon plant is located in the heart of one of the most productive areas in the state of Washington, it is believed that the need for cold storage facilities here, as elsewhere in the Pacific Northwest, will continue to meet with an increasing demand.

Warehousemen Point Out Low Beef Storage Rates

THE public refrigerated warehouse industry has assured the Secretary of Agriculture that its rates for the storage of beef are in line and low enough to have little effect on the ultimate price the consumer pays for this commodity at the retail level.

In a letter to Secretary Benson, William Dalton, Executive Vice President of the National Association of Refrigerated Warehouses, pointed out that "storage and handling charges for perishable foods are an infinitesimal part of the ultimate price paid by the consumer. As an illustration," he said, "some of our member warehousemen have told us that beef may be stored for three months at less than a penny a pound."

In addition, Mr. Dalton told Secretary Benson that "being a vital link in our Nation's chain of distribution, the public refrigerated warehouse industry is constantly aware of its responsibilities to the farmer, the consumer and the rest of the nation."

A response from USDA affirmed Mr. Dalton's statements and added that "we also realize that warehouse charges account for only a very small portion of the farm-retail price spread for meat and similar commodities."

Storage Warehouse Provides New Center For Frozen Food Industry

WITH the completion of $350,000 worth of additional building and equipment in their plant, officials of the Sanger Ice and Cold Storage Company are looking forward to making a new center for the frozen food industry at Sanger, Calif.

Two plants handling peaches, nectarines, berries and several varieties of fresh vegetables, are using the facilities of the local plant, which has expanded more than four times its original size to meet the rising demand for frozen foods. The recent expansion added three new cold storage rooms and a large processing chamber.

The temperature in these storage chambers is kept at five degrees below zero. A near arctic temperature of Minus 40 F is maintained in the actual freezing chambers, 12 tunnel like chambers through which the freezing air is pushed by fans.

Leslie G. Blue, the manager of the plant, said approximately 500 horsepower of additional motors were needed to meet the cooling requirements of the expanded storage and freezing chambers. This brings the motor capacity of the big engine room to about 2,000 hp. The processing room is 29 x 102 feet with the storage chambers covering 102 x 109 feet in the largest, and 40 by 60 feet in the smallest. The middle chamber is 57 by 102 feet.

One of the newest additions in the equipment line is the big tray freezing device which will be used for quick freezing the small packages of eight to twelve ounces. Prior to this time most of the local operations have been 30 pound cans.

Insulation of the new rooms has been effected with thick paddings of redwood bark and pressed wood fiber. The ceilings have been covered with some 38,400 square feet of fiberboard to a depth of six inches. An additional covering of 1,200 cubic feet of Fiberglas was used. Approximately 32 tons of shredded redwood bark was used for insulation of the walls. A mixture of crumbled cork and concrete was used for flooring the entire building.

The additional building gives the plant 480,000 cubic feet of storage and working space, bringing the total available for storing frozen fruits and vegetables to 766,000 cubic feet. Three condensers, various inter coolers, ammonia pumps and other devices for cooling the ammonia under pressure are used to supply the 35,000 feet of freezer coils in the new building.

Each of the old chambers is isolated from the others by heavy freezer doors nearly a foot thick, 10 of them dividing the rooms and alley ways. Automatic fire doors also protect the entrances of each compartment in the huge building.

The plant is more than four times the size of the original building erected in 1940. The first cold storage room was built in 1949. A portion of the original building was revamped in the latest building project to convert it for storage of ice blocks which will be used in summer months by Sanger packing houses and for icing operations on the West Side. The new expansion has raised the plant's ice making capacity to 150 tons a day, just twice what it was.

Expansion Program Modernizes Dairy Plant

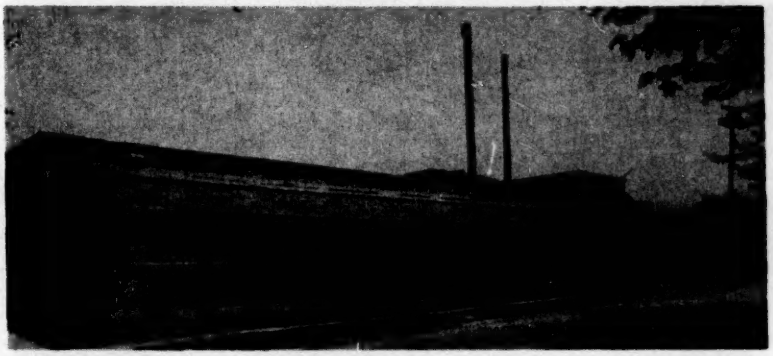
AS A RESULT of an expansion program completed recently, the dairy products plant of L. S. Heath & Sons, Inc., of Robinson, Illinois, is now one of most modern in the nation, according to company officials. The program, begun a year ago, included the addition of an $82,000 building to the dairy plant, a garage and maintenance shop, 100 by 65-feet and added warehouse and storage space for the company's candy manufacturing operations. L. S. Heath & Sons, founded in 1914, employs 350 people and processes milk and other dairy products; bottles soft drinks and manufactures ice cream and the Heath English Toffee candy bar.

The new building, 84 by 72 feet, houses the company's Grade A operations and contains the latest and most scientific equipment for homogenizing and pasteurizing milk. Two machines for bottling half gallon and quart containers of milk are located in the new addition.

A new cold storage room, 48 by 24-feet, wrapped in Fiberglas insulation was built in the addition to assist in maintaining a uniform temperature of 38 degrees Fahrenheit for all dairy products.

Ice Making Equipment

New ice making equipment was installed to manufacture 30,000 pounds of ice every eight hours. The ice is used to chill water which is circulated throughout the plant to cool the finished dairy products to a temperature of 38 F. The chilled water also supplies refrigeration for the cheese and soft drink bottling plants, and cooling for ice cream process.



Exterior of L. S. Heath and Sons dairy products plant including new addition.

Refrigerating Equipment

Principal refrigerating equipment includes two York compressors, one 6½ x 6½ and a 5 x 5; a York IDV 49-A3 air unit for the new cold storage room; and the CP ice builder, 15 ton capacity. Air conditioning of the offices is by Frigidaire equipment.

Dairy processing equipment includes the following Cherry-Burrell items: 6000 lb. per hr. homogenizer, a 10,000 lb. per hr. hi-temp. short-time pasteurizer, 200 gal. spray type vat and a 150 gal. vat.

Creamery Package equipment includes a 24,000 lb. per hr. plate cooler, 200 gal. pasteurizing vat, and 300 gal. pressure wall pasteurizer. Other items of dairy equipment are two-300 gal. and one-2000 gal. storage vat, clarifier, separator and standardizer-clarifier. Receiving room can washer is Lathrop Paulson.

The pasteurizing and homogenizing equipment shown in the illustration includes a stainless steel pasteurizing vat, homogenizer, vari-speed motor, gears and Waukeshau pump, heater, short time pasteurizer, and pasteurizer control board.

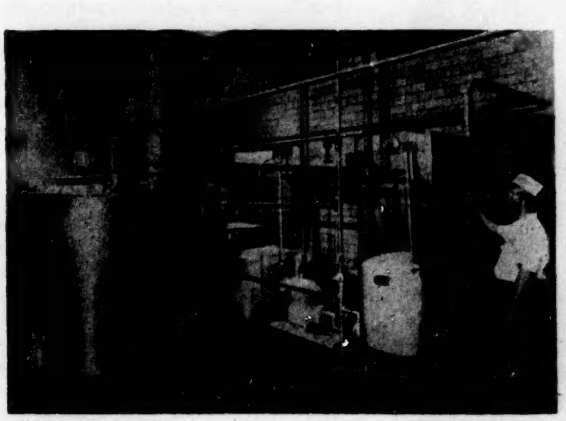
A modern ventilating system provides for a complete change of filtered air each four minutes. Natural light enters the building through glass block which diffuses and distributes it evenly throughout the rooms.

Loading Facilities

Loading facilities have been increased by enlargement of the dock space so that 12 or more milk delivery trucks can be loaded at one time. A second floor above the cold storage room provides space for storing two carloads of paper milk cartons. Boxes of the blank cartons are fed to the bottling machines by a gravity chute. This room is air conditioned and de-humidified.

The milk processing rooms are constructed of ceramic-glazed tile in

(Continued on page 42)



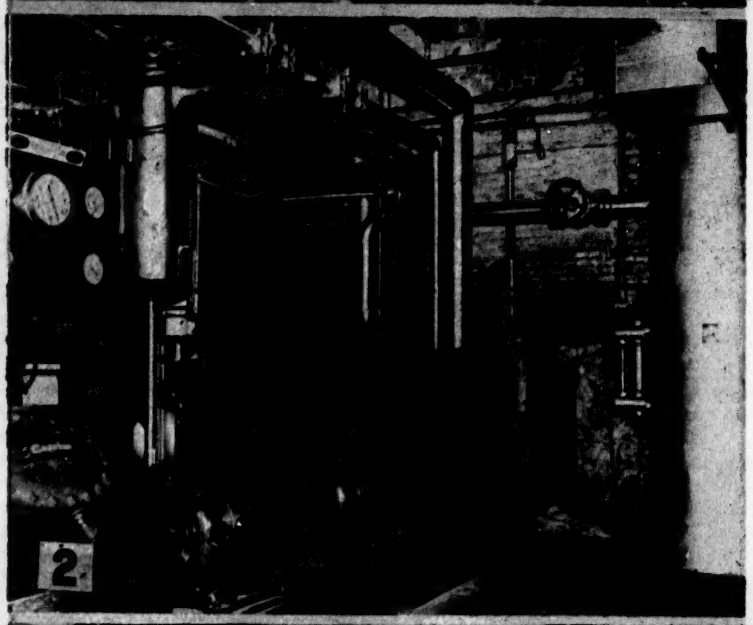
Pasteurizing and homogenizing equipment of new addition to Heath Dairy Products plant showing homogenizer, pasteurizer and other equipment.

Fiberglas boards installed in ceiling areas of new milk bottling room.

Refrigeration Ins
Fully Automatic
For New Cold St

THE question, "Is it feasible to install a completely automatic refrigerating system for cold storage warehouse operation?" aroused considerable interest when it was posted at the National Association of Refrigerated Warehouses convention in Washington, D.C., last May. Two months later, it was at least partially answered with the announcement that what is believed to be the most

PICTURE LAYOUT OF COMPLETE
REFRIGERATED NEW



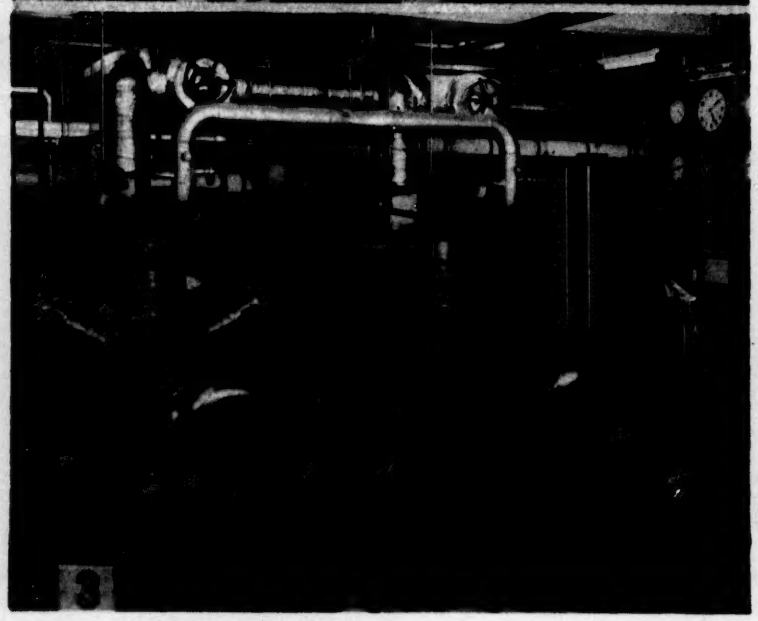


Fig. 1—Easily accessible by rail or truck, this new single-story warehouse at Denver, Colorado is occupied by Beatrice Foods Company (right). K & B Packing Company occupy building at left. A crawl tunnel under the railroad tracks and driveway interconnects high and low stage compressors which are installed separately in each plant.

Fig. 2—Two Carrier high-stage compressors in the engine room of the K & B Packing Company plant in the two-stage system are 4-cylinder 6¾ in. bore x 5 in. stroke, direct-driven by 700 rpm motors. Discharge gas from the low-stage compressors is cooled in the inter-stage cooler at the right by bubbling the gas through a liquid ammonia bath bringing the gas to saturation at an intermediate pressure of around 25 psig. Compressors take the saturated gas and discharge it through a discharge oil separator to the condenser and receiver at the back of the engine room. The liquid ammonia bath in the inter-stage cooler is maintained by Alco Lectro-Level control apparatus. Also see Cover Picture.

Fig. 3—In the machine room below the office of the Beatrice Foods plant are two Carrier low-stage compressors of the two-stage low-temperature refrigerating system. One of the two 6-cylinder, 7 in. bore x 5 in. stroke compressors normally serves the general storage and holding room at around 0 psig. The other handles the last freezer at around 10 inches of vacuum. Both are direct-connected to 700 rpm motors. Control panel to the right contains pressure gauges and various pressure switches for automatic control of these low-stage compressors. Continuous temperature recording chart at lower portion of panel automatically keeps a running log of the temperatures at various points in the warehouse.

tallation Provides Control Operation orage Warehouse

completely automatic refrigerating system for blast freezing and frozen food storage in the country had just gone into operation in Denver, Colorado.

In the belief that refrigeration engineers, consulting engineers, industrial executives of heavy-duty refrigeration plants, and architects, would like a complete run-down of this new approach, INDUSTRIAL RE-

Y AUTOMATICALLY OPERATED TORAGE WAREHOUSE

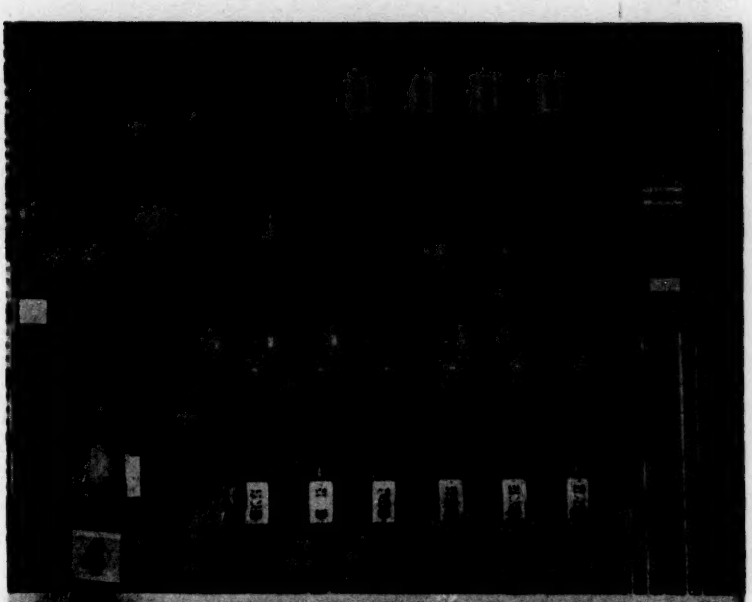


Fig. 4—Located on the outside platform are the surge drum controls which serve as part of the automatic nerve center of the system. There is one Alco Lectro-Level control for each cold diffuser and each section of coil in the holding room, and one for maintaining liquid level in the inter-stage cooler located in the K & B engine room. Adjustment of the liquid level in each evaporator to prevent flood-back to the compressors is made in these Leveltrols when the plant is first placed in operation. The small lights in the centerboard indicate whether or not the individual boxes are receiving power. Two lights in the switchbox attached to each Leveltrol case indicates whether liquid is being fed to the evaporator it controls.

Fig. 5—Atop an anteroom in the smaller of the two storage rooms is a suction accumulator and controls for operating almost three miles of two-inch ceiling coil on the flooded ammonia principle. The coils are divided into three banks, each with its own surge drum and liquid level control. The accumulator prevents refrigerant flood-back to the compressors by separating out entrained liquid in the suction gas. Defrosting is done manually using hot ammonia gas.

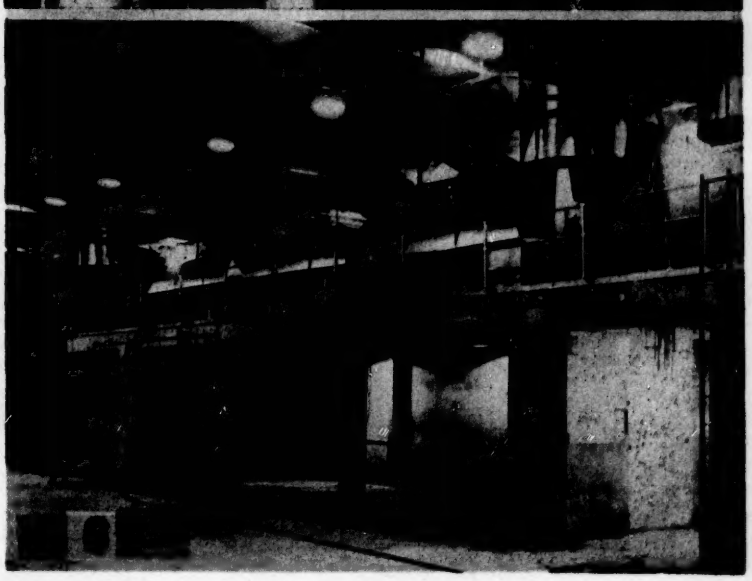


Fig. 6—Close-up of blast freezer located in the general storage room. Three cold diffuser assemblies are on top of the blast freezer. Each compartment, approximately 15 feet square by 9 feet high, is served by one cold diffuser. Dampers on discharge side of fan direct the air either into the general storage room or into the blast freezer. The dampers service the main room. With dampers closed, cold air is discharged into blast freezer area traveling down the inner side of the overhead garage type door and passing horizontally through the product.

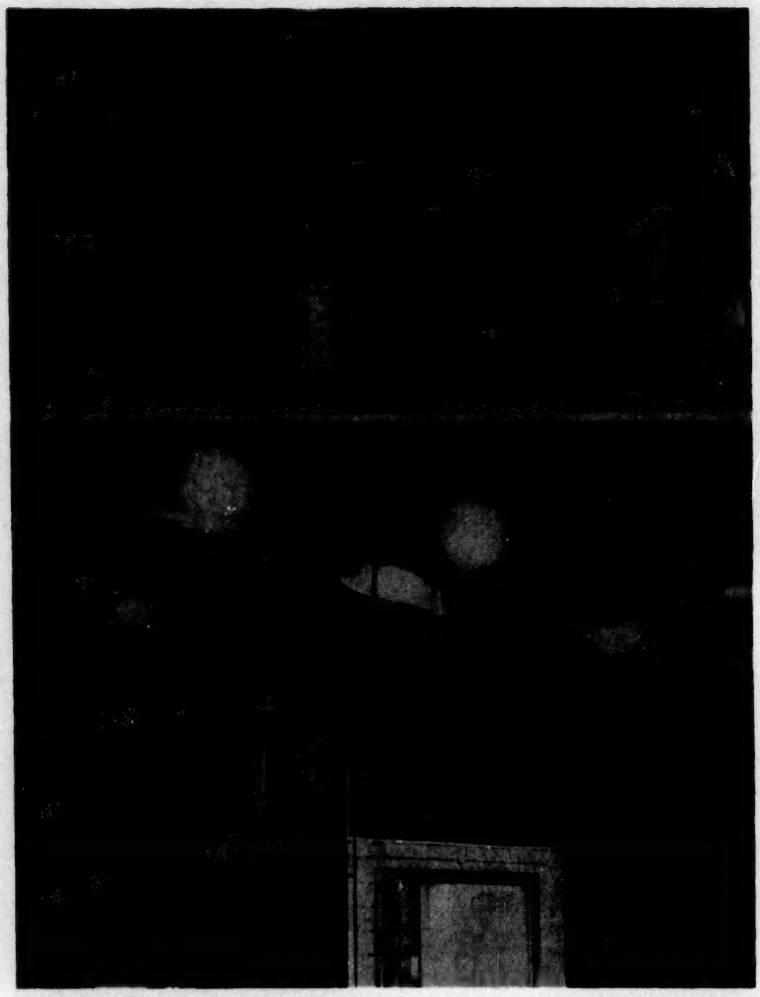


Fig. 7—Looking from inside the general storage room is the batch-type blast freezer (left). Anteroom (airlock) passageways at center of picture and extreme right are used for entering or leaving refrigerated space. Swinging doors at each end of the "lock" minimize the loss of cold air when fork-lift trucks go in and out of the rooms.

Fig. 8—Close-up of one of three anterooms in the general storage room. A large dry-coil type cold diffuser is mounted above each airlock passageway. The cold diffusers operate on the flooded ammonia principle using surge drums with float switch refrigerant control. The coils are defrosted by water. Note large drain from the water pan atop the airlock for rapidly disposing of slush from the coils during defrosting. Refrigerated air is distributed evenly throughout the room by ductwork radiating from the cold diffusers.

FRIGERATION is presenting herewith a story in pictures of the completely automatic system.

The Beatrice Foods Company one-floor plant containing 500,000 cubic feet of storage space and the neighboring K & B Packing Company are separated only by a railroad and sidings running between them. The two concerns are independent except from an operational standpoint.

The high-stage compressors and condensing equipment for the two-stage ammonia system are located in the K & B engine room and the low-stage compressors in the Beatrice plant. Running between the two compressor rooms is a crawl tunnel containing necessary refrigerant piping, electrical control lines and other services needed for the operation.

Attendants Check Operation

Separation of the two stages permits conditions throughout the modern plant to be observed by one attendant on duty over an eight hour period at the Beatrice plant, and from a control panel in the K & B plant for the remaining 16 hours each day and weekends, when the system functions unattended. Attendants are on duty around-the-clock at the K & B plant.

In the event of malfunction, high pressure cutout switches shut down high and low-stage compressors. If there is a failure in the lubricating system, oil pressure switches will also shut down the compressors. Discharge gas temperature controllers shut down compressors when predetermined low temperatures are registered as a result of flood-back to the compressors. When such failures occur an alarm is sounded at both the Beatrice Foods and K & B plants summoning the attendant on duty to correct the condition.

In the event of outside power failure, electric controls stop the compressors as well as the flow of refrigerant. Upon resumption of electricity, the compressors automatically go back on-line.

During regular operation automatic capacity control is obtained by means of by-passing compressor cylinders. The mechanism to accomplish this is actuated by pressure switches connected to the suction mains leading to the compressors. Low pressure cutout switches shut the compressors off when prescribed temperatures have been attained and turn them on when refrigeration is needed.

Diversified Products Stored

The storage plant, made of reinforced concrete, quick-freezes and holds such products as beef, pork, mutton, turkey, various kinds of poultry and selected fruits. It is divided into two large general refrigerated storage rooms, one of which contains a three-compartment blast freezer.

The largest of the two rooms receive foodstuffs which have come by rail or truck to be blast frozen or sharp frozen. The smaller room is generally used for storing frozen products for long periods of time. Both are maintained at minus 10 to minus 20 F.

Tenant facilities are available on the railroad side of the warehouse providing at-the-plant packaging of products to be frozen, especially turkeys and other poultry which has been shipped to the plant in barrels surrounded by crushed ice.

The capacity of the refrigeration

(Continued on page 42)

TO BUILD OR RENT STORAGE SPACE

Volume storers of perishable foods may choose between building their own space or using facilities of public refrigerated warehouses. A compilation of views on this important subject.

EDGAR R. CURRY,
Managing Editor
Industrial Refrigeration

THE normal reaction of volume storers of perishable foods would be that refrigerated warehousemen are inherently prejudiced in favor of their own services as opposed to cold storage space built by a manufacturer or processor for his own use. That may be true. But on the other hand there are facts about this business of storing perishable foods which warehousemen are in peculiar position to know. The potential storer, for his own protection, should give careful consideration to these facts before investing money in his own volume storage space. And cold storage construction, particularly if built for low temperature, does cost money—to build and to operate.

Any attempt to discuss this subject from a strictly objective viewpoint, which is the only viewpoint of value in such an article, meets up with some formidable obstacles.

In the first place, more real facts should be available. All too much of the thinking on this question is based upon supposition. Does anyone know, really know, whether public refrigerated space is more economical than private? Based on factual data, does the use of public warehousing relieve large storers of burdensome financial investment and responsibility? Can any one specifically point to factual data which will prove that the technical know-how of the public warehousemen is superior to that of the private one? What constitutes an experienced warehouseman? Are the answers to all these questions different for different types of operation?

In this article we are going to try to break through the barriers of these seemingly formidable questions, at least to the extent of presenting some known facts that may serve as guides toward formulating some sort of answer to this very important question.

The Financial End— Is Refrigerated Warehouse Space More Economical

The question of costs, of construction primarily, would go a long way toward providing a categorical answer to the above question. Unfortunately they are not known in their entirety. Warehousemen do have figures for their own construction costs, but there are many other factors that should be included to provide a complete answer.

Historically, the cold storage industry has not been a particularly profitable one. Not a few, but numerous cold storage warehouse companies have gone into bankruptcy and receivership. In the period 1927-30 there was a very definite overconstruction of cold storage space, resulting in disaster to investors in the securities of companies operating the space. It must be remembered that cold storage construction is exceedingly costly, and now the capital investment necessary to construct a cold storage plant is greater than ever before.

A question which many volume storers of perishable foods, not in the refrigerated storage business, have asked themselves, and upon which they have pondered and sought information, is whether to build their own refrigerated storage space or whether to use the established facilities of public refrigerated warehouses. This article is a compilation of the views and expressions of refrigerated warehouse operators who have been in the business of storing perishable foods for many years.

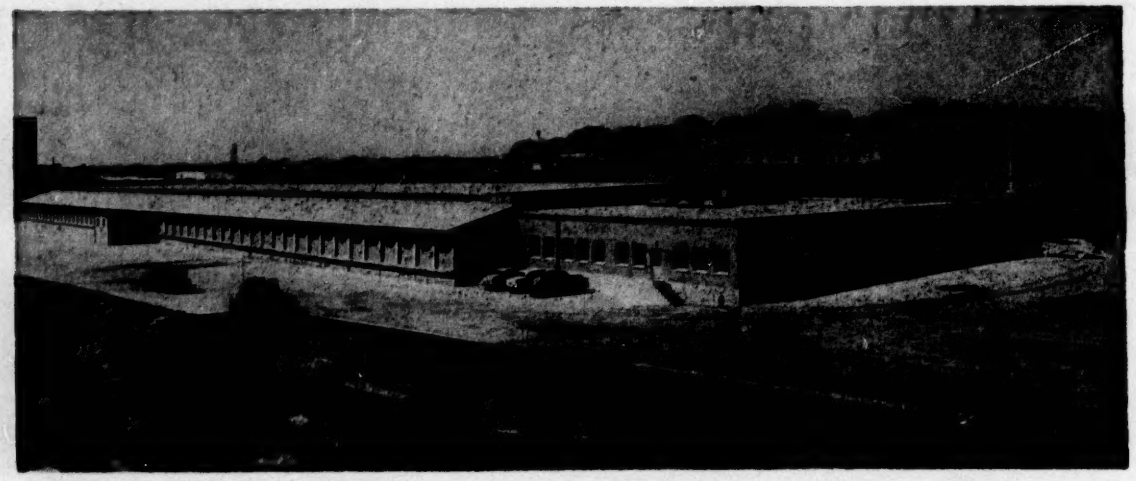
From their vast storehouse of experience and from such sources as government experiment stations and The Refrigeration Research Foundation, they have an extensive fund of information upon which they have drawn to furnish the factual background for this article. Besides this huge reservoir of practical experience and technical information which they use to serve their customers, they also know the risks and pitfalls inherent in merchandising and operating refrigerated warehouse space. The purpose of this article is to furnish facts and data which the volume storers mentioned above may use to help them decide whether to build or rent storage space.

The building itself must be of sturdy construction to permit of heavy floor loads. Insulation, refrigeration, piping and machinery represent a large item in the cost of a finished warehouse. The sizeable sums of money invested in this specialized equipment practically makes a cold storage plant a one purpose facility. It cannot be used for other purposes except at a tremendous sacrifice of investment in these items. A one purpose facility does not readily attract capital seeking investment.

Figures obtained from current warehouse construction show that it costs approximately 75 cents to $1.20 per gross cubic foot of refrigerated space to build a modern refrigerated warehouse, depending on location, equipment, provision for special services and the size of the plant, the lower figure representing larger houses which cost proportionately less per unit. A million cubic foot warehouse therefore would involve an investment of at least $750,000.

In the development of the frozen food business, the growth has been tremendous and the end of expansion is not in sight. The producer who owns his own private warehouse must either build a larger house than his immediate requirements, to anticipate growth, and thus tie up additional capital, or face the problem of having too small a warehouse with the problem of warehouse expansion at a most inconvenient time. Those who use public refrigerated space have the opportunity of occupying and paying for just the amount of space they require.

Most of the members of the perishable foods industry must of necessity operate on a working capital low in ratio to their sales. It would be to their betterment to use this capital in the financing of their own business



A large public refrigerated warehouse such as this offers adequate space for storing perishables as well as trained personnel who are experts in the handling and storage of such goods.

and to have capital available for the purchase of raw materials or inventory which can be quickly turned over for reinvestment, rather than putting their money in bricks and mortar which at best yield only a modest return on investment.

Large and constant users of store and office space find it more profitable to hire space than to own buildings. Where the demand for facilities is seasonable, as in cold storage warehousing, the more profitable use of the capital is in the primary enterprise, rather than in investment in a cold storage plant. It is better economics to avoid the carrying cost and operation of warehouse property in the off-season and free capital to use in the primary business.

This is particularly true during the present period while building costs are extremely high. Storage rates have been kept reasonably low across the country because of the relatively low building costs in prewar years. Another point that a small enterprise should consider carefully is that a small warehouse costs considerably more per square foot to construct than a large warehouse.

But the cost of construction is a minor part of the story on costs. We turn now to the operation side.

Costs of Operation

Experience throughout the years has proven that there is little opportunity for planning ahead in the cold storage business. In other words, there is no assurance of stability in volume of business and earnings. When there are bountiful crops or in periods when the government is required to store either on a price support program or for the purpose of assuring food for millions in the Armed Services, there results an abnormal demand for cold storage space. Ordinarily, however, there are severe fluctuations in demand and use of cold storage facilities with no possible set pattern of performance, with resulting fluctuation in costs and profits.

Refrigerated warehouse earnings generally run not more than seven percent on invested capital (another estimate is three percent) in a period of very good business. The private storer, with small facilities which would be either quite expensive to build on a unit basis, or so large as to produce a low rate of occupancy and high operating cost, therefore would have a tremendous obstacle to overcome to make his warehouse a paying investment, with the inevitable peaks and valleys of high and low occupancy. He would have to have sufficient space to take care of periods of peak demand, and then would have the problem of filling that space as the normal marketing season progresses and the unavoidable seasonal production slackens.

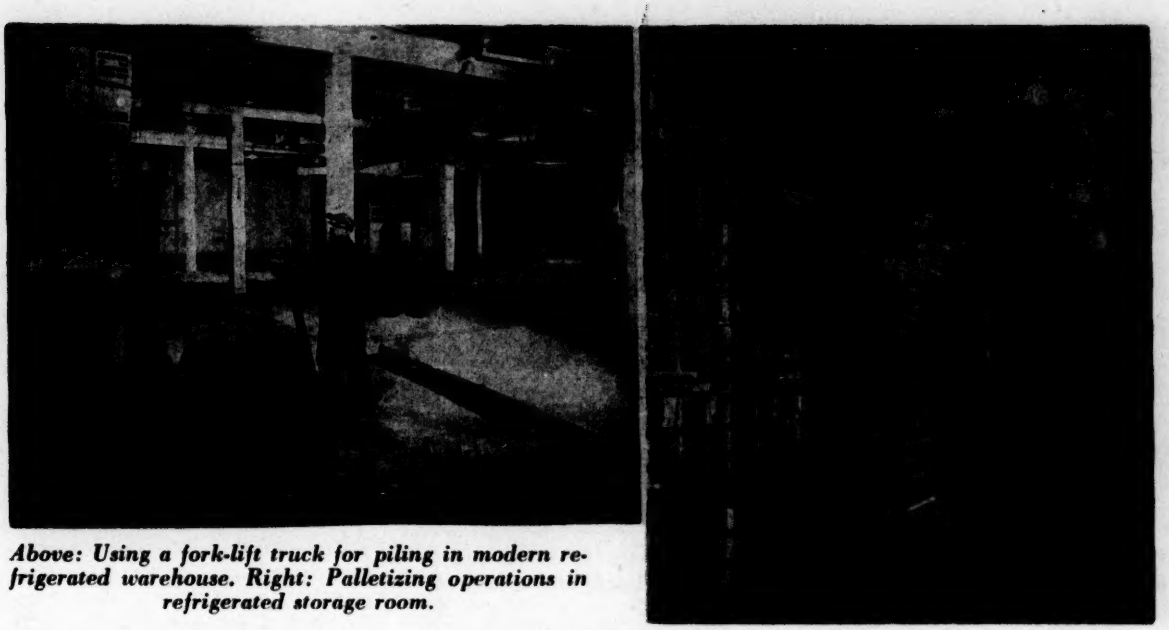
The experience of successful warehouse operators has proved that a warehouse must be occupied for a major portion of the year at a capacity not less than 70 to 75 percent if he expects to break even. In most cases, that involves a location permitting the inbound movement of certain items to dovetail with the outbound movement of others. A one-crop warehouse ordinarily is not considered a good investment, and cannot make money except at high rates on the one stored commodity.

Not being limited to the storage of one commodity, warehousemen are able to avoid more readily the costly factor of low occupancy, which the private storer must inevitably face between periods of moving out the surplus of last year and storing the new crop.

Several surveys of earnings have been made of the larger operating companies in the industry. These surveys show that the percentage of earnings to invested capital is considerably less in this industry than in many other American industries. Most manufacturing companies can double their capacity of production and consequent earnings by operating two or three shifts and by other means. A refrigerated warehouse is confined in its earnings to the actual storage space contained in the area of the building itself. Even though products for storage may be readily obtainable, the warehouse cannot accommodate more products and thereby accumulate more earnings after it is filled.

There are two outstanding and evident conclusions that can be stated: (1) that the return in earnings on investment in cold storage warehouse operation is not proportionate to the amount of invested capital and risks involved and (2) that the public cold storage warehousing companies have not imposed on the storing public in the assessment of rates for services performed.

The public refrigerated warehouseman's costs are based on twelve months occupancy, allowing him to realize greater economies through the greater utilization of storage space. The public refrigerated warehouseman does not concentrate on the storage of one particular commodity. On the other hand, the volume storer who constructs his own refrigerated storage facilities is usually handling one particular commodity that is a seasonal product. It follows then



Above: Using a fork-lift truck for piling in modern refrigerated warehouse. Right: Palletizing operations in refrigerated storage room.

that a season of low occupancy will effect a sharp increase in his total costs, since fixed expenses are not offset by storage revenue. This point is worth a second glance by anyone contemplating the construction of a private warehouse.

As the diversity of the warehousemens' operation reflects economies in the space utilization, so are labor economies effected. Trained warehouse labor, accustomed to freezer and cooler working conditions, and experienced supervisors are always available for the processor's peaks or the distributor's "specials." Modern materials handling equipment which serves to expedite the handling and storage of widely divergent package sizes and containers and product is available for the rapid movement of customer's storage stocks. In short, the fluctuating demand for labor, equipment and space, is readily met for the storer by the warehouseman, and without making it necessary for the storer to tie up additional cash outlay in fixed assets or idle labor.

The question of transportation and of adjacency are vital cost as well as convenience factors. In many cases it is the cost of transportation that largely determines whether rental of space in a public refrigerated warehouse or the investment in a privately owned and operated warehouse would be the better business buy.

The experience of many private storers has shown that the operation of their plant in close conjunction with a public refrigerated warehouse has proven to be the most efficient and economical operation. There are many reasons for this including: Minimum transportation costs; minimum tie-up of capital; minimum labor costs; minimum storage costs; greater ease of financing, whether through banks or directly with the warehouse.

Another sizeable factor is the cost of electric power. The average cold storage plant uses enough electricity per year to be placed in a cost bracket far lower than it would cost the average distributor. In many instances the private storer would have to pay from three to five times as much per kw as the public cold storage warehouse.

It is common knowledge that food distributors are working on a narrower margin of profit than they formerly did; in fact, so small that it would hardly pay them to erect expensive cold storage space, pay the high electric cost to maintain and operate such space and, particularly because their entire overhead will remain constant while their buying policies may dictate from time to time that they maintain only small inventories in these high cost refrigerated rooms.

A processor may feel that the public warehouses are making big profits, when he pays them several thousand dollars a year for storage and handling charges. He may feel that he could build and operate his own plant with his storage costs of a few years. But it must be remembered that warehousemen pay out thousands of dollars for labor, for supplies, for maintenance, for supervision, for taxes, municipal, state and federal. A year or two of poor business may create a scramble for tonnage, storage rates may tumble, the producers receive some bargain buys, but the warehousemen must maintain his property, he must pay his labor, he must meet his interest payments, he must meet the maturities of his debt.

Consequently, the prudent warehouseman regulates his charges to allow for his necessary expenses, proper reserves to meet his obligations and a modest profit on his investment. As a matter of fact a careful survey would show that by the history of warehouse charges over the past 20 to 25 years, today's costs to the storer have risen proportionately less than any supply or service he has purchased in that length of time.

Relieves Management of Responsibility of Operating This Separate Business

Obviously the operation of a refrigerated warehouse involves the financing and day to day operation of another business than the one in which the producer or distributor of perishable foods is primarily interested. Except for a large organization, this would throw a tremendous burden of responsibility upon management.

The seasonal nature of the food business prevents the maintenance of adequate product balances to utilize fully the privately operated warehouses. The meat packer, the frozen food packer, the dairy processors—all have high peaks of production and resulting high volume storage. This production cycle poses problems difficult to solve. If the warehouse is built for peak storage, many months of the year it will be operating at less than half capacity,

The network of pipes in this cold storage room carries the refrigerant to keep temperatures as low as minus 20F. Palletized stacks of frozen foods are in the background.

and during years when production is extremely low, warehouse ownership will prove a burden.

On the other hand, a warehouse sufficiently small to maintain a high occupancy throughout the year, every year, may be too small to justify the investment and trouble to operate. Problems of this nature are minimized in the operation of a public refrigerated warehouse, for the warehouseman maintains an adequate balance throughout the year by storing various products, differing in production periods. The public warehousemen take from the shoulders of private storers the risk of maintaining a paying storage balance.

The history of the perishable food industry shows that larger storers have found public warehouses more economical than building and operating their own space. This thinking prevailed even in the days when manufacturers, processors and distributors were not burdened with such a heavy tax load and generally had more money available for capital investments. The situation is still less favorable now because of increased costs of construction and operation.

There are few if any storers that could afford to build and operate the facilities necessary to provide them with the widespread distribution that is available through public warehouses. There are few that could afford to make the investment and take on the financial and physical responsibilities of operating a chain of distribution or transit houses across the country. The liabilities would be tremendous. Even the chain groceries, in their drive toward the elimination of middlemen, haven't found it possible to get away altogether from the use of public refrigerated space. The investment, the specialized know-how, the responsibilities and liabilities involved are apparently too great for them to undertake construction and operation of refrigerated space to take care of all their needs.

Each producer, manufacturer and distributor who has used public refrigerated warehouse space knows his public warehouse and handling costs as well as his accessory service charges per unit with an accuracy not possible when he does his own handling with a constantly shifting overhead. In his own operation, his costs vary with the tide of his business. It stands to reason therefore that the public refrigerated warehouse can do it for less.

Being free of investment in any one spot, the producer has his choice of locations for the warehousing of his product. He knows that those engaged in the business of warehousing will expand their facilities as the demands for space grow, he knows that if warehouse costs are out of line, it is only a question of time until the competitive situation will adjust that condition.

An investment in a refrigerated warehouse is only practical when it is calculated on a long period of time—say fifty years. For the private storer especially, its location is most important. If the producer has his own warehouse, he has no choice but to place his product there, even though in time it may become inconvenient. For those who change their locations of processing due to crop failures, better crop opportunities elsewhere, shifts in population, opening up of new producing areas, shifting of market areas, or for any other reason, such an expensive and immovable asset might lead to partial or complete abandonment of the warehouse, or entail heavy transportation costs from new production point, or a hindrance to meeting changed conditions as they arise. The producer with no private warehouse has a wider choice of locations at or near the points of production or consumption, or an intermediate point between the two.

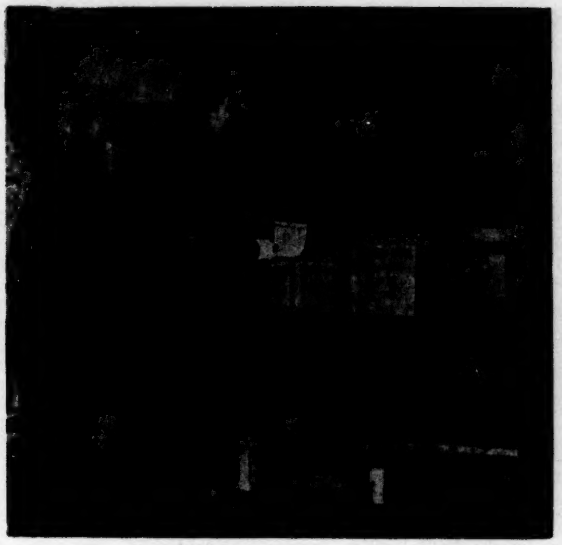
A storer looks to the warehouseman to maintain proper temperature and humidity control and to exercise due care and diligence in the storage of his product. The warehouseman willingly accepts this responsibility for this is his "stock in trade". The processor or distributor who constructs and operates his own cold storage warehouse, on the other hand, must likewise accept this responsibility, and know how to meet it.

The frozen food industry is expanding so rapidly that a distributor who has a reasonably large volume would find a break-up room of his own practicable. Such facilities would not require a large investment. However, even such a relatively small space, if available in a public warehouse, might be considerably more economical than the building and operation of the space by the distributor.

Many distributors find it economical to own as little merchandise as possible from day to day. It is becoming quite common for packers to store consignment stocks in public warehouses in order to make it possible for the distributor to buy only what he needs currently and which he can distribute and sell promptly, and which merchandise can often be sold before payment is even due the packer. This is also an advantage to the packer who can spot consignment stocks throughout the country at public warehouses so that his merchandise is readily available to the numerous buyers of a large trade territory on today's competitive market.

Refrigerated Warehousing A Specialized Business

The reasons for the existence of public cold storage warehouses as against privately owned facilities are several in number. Stored in the refrigerated warehouses of this country are perhaps 100 or more important perishable commodities and food



Break-up room provided by refrigerated warehouse for frozen food customers for the filling of orders for retail outlets. As the order is processed it is repacked in cartons which are moved along a conveyor to scales where the orders are rechecked and weight recorded. Here the packages are placed on pallets for movement to the loading dock.

products. Many of these commodities are seasonal in their production and requirements for storage. A commodity may occupy a substantial portion of a warehouse space for three or four months and is then withdrawn. Another commodity seasonally is ready to fill that space made vacant. For example, shell eggs are stored in the Spring of the year and are practically out of storage in the Fall. Apples are stored in the Fall of the year and are practically out of storage when eggs are coming in. Poultry is stored in the Fall and is out of storage when butter is produced in the late Spring and Summer.

Technical Information

A vast amount of money has been spent and is being spent to obtain technical information on the required temperatures and humidities needed for best results and how long a commodity can be kept in storage on a long and increasing list of commodities. The successful public refrigerated warehouseman has this information. Not content with relying upon government experiment stations and other agencies of the United States Department of Agriculture to develop this knowledge, the refrigerated warehousing industry a few years ago instituted the Refrigeration Research Foundation, whose job it has been to seek answers to a wide range of questions regarding best storage practices. This has resulted in a vast fund of information valuable to members of the industry, and available to their customers.

It is recognized that refrigerated warehousing is a specialized business. Only rarely does a warehouseman engage in processing or distribution. Conversely, processors and distributors likewise are specialists in their respective fields of production and/or distribution; and to enter a field which requires the specialized training and experience necessary to successfully operate a refrigerated warehouse would be like starting a new business.

And besides this technical knowledge at the top, successful warehouse operators lean heavily upon their employees who through special training and years of experience have learned how to handle commodities into and out of storage the way they should be handled, providing maximum protection for the product. It has not always been an easy task to keep trained men on the job; labor turnover has at times been a headache. If this be true at times for the established warehouse with its engineers and supervisors, how much more of a problem would it be for the private storer faced with the necessity of keeping a trained force on duty, hampered by seasonal layoffs.

If the private operation is not large enough, these trained men needed to operate the refrigerating equipment as well as the mechanical handling equipment will not be used to their fullest capacity the year around and the costs will therefore be high. Maintenance crews are needed to service all types of equipment on a moment's notice, to prevent losses of product or production time, thus making again for high costs.

In practically all instances refrigerated warehouses already have the required facilities, or will provide facilities for any sound requirements. For instance, there are such necessary services as quick freezing facilities, pipe line refrigeration, car icing, pool car distribution, rental of office space and providing break-up rooms. The warehouseman stands ready to perform many extra services for his customers, many of whom which are so essential that without them many storers could not operate their business profitably.

Conversion of cooler to freezer or freezer to cooler space are readily accomplished by the warehouseman today, thereby providing him with more flexibility than exists with the privately operated warehouse, particularly if that facility is designed for a specific purpose requiring a predominance of either freezer or cooler space. The availability to the storer of these extra services should be carefully considered in the determination of whether private facilities or the use of public warehouses would be better business.

For example, owners of products stored for long periods of time, find it essential to finance these inventories. The most convenient way of 6—Ind Ref. Brog 9—8xon10—13.... doing this is through the use of negotiable warehouse receipts, available only through public warehouses, upon which cash can be obtained to finance further purchases, sales programs, labor costs, and other current expenses. Before constructing a warehouse, the prospective operator of private space should consider well the financing opportunities based on negotiable receipts issued by public warehouses.

Cut Flower Storage

FURTHER research on storage of cut flowers without stems in water has been reported from Cornell University, Ithaca, N. Y. In the studies reported, Dr. Charles Fischer used carnations, pompon chrysanthemums, roses, lily-of-the-valley and garden lilies, and compared moisture-proof packaging without stems in water with storage with stems in water, with and without the patented plant food Floralife. He reports that flowers stored in the dry condition, in moisture-proof packaging, were in general superior to those stored at the same temperature with stems in water without or with Floralife. Severity of molding in confined packages with high humidity was far greater at 35 to 45 F., than at 31 to 35 F. It should be stated, however, that not all investigators agree with these Cornell investigations.—TRRF Information Bulletin.

Eighth All-Industry Exposition Attracts Record Visitors and Bigger Exhibits

WITH 13,500 visitors and 234 exhibitors, the 8th All Industry Refrigeration and Air Conditioning Exposition held in Cleveland, Ohio, November 9 to 12 inclusive, showed a healthy increase in both categories over any previous show held by the industry. The exhibits occupied more than 61,000 square feet of floor space, an increase of almost 5,000 square feet over the show last year.

The increase in the number of exhibitors does not, however, tell all the story in this rapidly growing show. There was an increased floor space occupied by the show this year, and an increase in the average space per exhibit. All this means that exhibitors are attaching more and more importance to the show and exhibiting a wider variety of their products.

For example, all year air conditioning is bringing more heating equipment to the show and some manufacturers who make heating supplies and parts in addition to refrigeration equipment are giving more space and prominence to these parts. The trend toward displaying heavier industrial equipment is another factor increasing the space per exhibit.

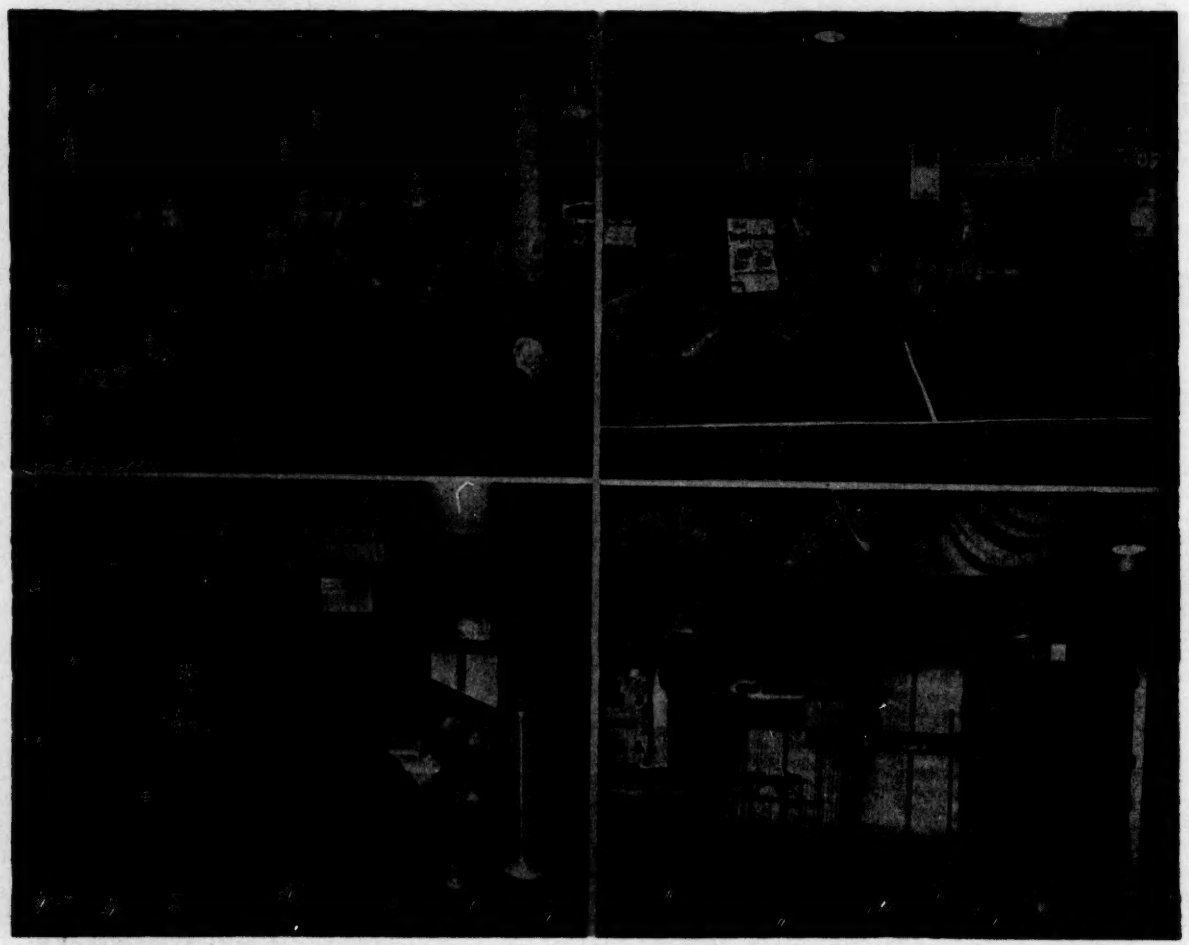
Exhibits ran heavily toward the air conditioning field this year compared to other years, reflecting, it is assumed, the result of tripled sales in this segment of the industry. Window type air conditioners accounted for the largest part of the air conditioning exhibits, but all year air conditioning, heat pumps, industrial air conditioning, and the newest addition—automotive air conditioning, were all on display.

Some of the exhibits had working or cutaway models or miniatures. Others showed movies, presented demonstrations, or distributed samples. Something like 5,000 products were on display from small to large.

Four trade associations held their annual conventions during the week, including wholesalers, service engineers, contractors and commercial sales groups.

New Meat Packing Plant

A NEW meat processing plant will be built at San Antonio, Texas, for Jacob E. Decker & Sons of Mason City, Iowa. The plant will cost about one million dollars and will replace a smaller plant at San Antonio.



Views of the Eighth All Industry Refrigeration and Air Conditioning Exposition. Top left, one of the aisles in this mammoth trade show. Top right, a close-up of the exhibit of Henry Vogt Machine Co., Louisville, Ky. Bottom left, close-up of Pacific Lumber Company exhibit, makers of Palco Wool insulation. Bottom right, close-up of exhibit of Jamison Cold Storage Door Company, makers of cold storage doors.

Two Stage System in Small Ice Cream Plant Provides Economical Operation

IN THE ice cream plant of Sidney Wanzer & Sons, Roseland, Ill., with a capacity of 2000 gallons per day, a unique arrangement of controls allows completely automatic day-time two-stage ammonia compressor operation, or night-time single stage operation. By virtue of a suction accumulator and liquid return system, the compression machinery can be allowed to run automatically in complete safety with little attention from the operator.

Fig. 1. View of refrigeration equipment at Wanzer Roseland plant, showing 6-cylinder booster and 2-cylinder high stage compressor. Long verticle vessel, insulated, in center, is liquid cooled intercooler. Short horizontal vessel behind that is suction trap. Horizontal vessels at rear wall are condenser and receiver. Note dump piping from trap to receiver.

Engine Room

The engine room installation includes two 6½x6½ vertical two-cylinder Creamery Package compressors of 25 hp and 30 hp, running at 300 rpm, with high torque motors and across-the-line magnetic starters. These are connected on a common suction header. There is one 5x3½ six-cylinder CP booster driven by a 30 hp normal torque motor, under two step control, running at 1200 rpm, and with complete unloading mechanism for starting. A vertical intercooler with Phillips float valve, cools the booster discharge gases. A Phillips liquid return system and suction accumulator are elevated above and in back of the intercooler (see Fig. 1).

The production freezers comprise three 40-80 gals. continuous freezers and one batch freezer. A novelty tank for ice cream bar production has a capacity of 12 molds. The hardening room is equipped with flooded fin coils arranged for air-defrosting. In addition, there are hose connections for four trucks. The freezers, hardening room and the trucks are on a common suction to the booster.

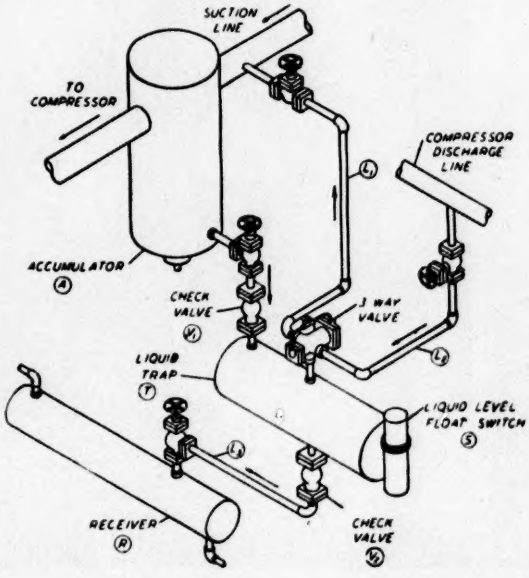


Fig. 2. Isometric sketch of liquid return system described. Slopover liquid moves by gravity from A to T. Three-way valve function releases it to R.

Day and Night Operation

The daytime operation is as follows: Normally the booster operates with one 6½x6½ machine. A pressure switch in the suction line to the booster, set to cut in at 5 psig and cut out at 2 in vacuum, controls the 50 percent unloader. A pressure switch in the discharge line from the booster starts a second high side compressor when the intermediate pressure exceeds 25 psig and stops that compressor when the pressure falls below 15 lbs.

For night-time operation, the booster is shut off manually and the valve by-pass is opened between the normal booster suction and the suction from inter-cooler to higher stage machines. One 6½x6½ then operates and is controlled by a hardening room thermostat; the other 6½x6½ operates on the truck demand and is controlled by a pressurestat set for 5 lbs. cut in and 2 in. cut out, with a fifteen minute time delay on cut in to prevent short cycling. When both machines cut off, a liquid solenoid valve to the trucks is shut off automatically. The wall thermostat in the hardening room

also controls the liquid solenoid valve supplying the room coils. This control set-up was devised to suit the plant operation by The Creamery Package Mfg. Co. Provision for a second booster has been made which will allow 40 percent additional capacity.

Return System

The operation of the return system, which is a patented development of the H. A. Phillips Co., Chicago, is as follows (see Fig. 2): The suction gases from the trucks, hardening room, and freezers, drops its slop-over liquid in the suction accumulator, where a flow of liquid by gravity to the trap takes place. When the trap is full, a float switch operates a three-way valve to equalize the trap with the receiver. Inlet and outlet check valves are so arranged that the pressure equalization allows a free drain of liquid by gravity to the receiver. The length of the dumping cycle is set on the timing relay, which automatically recycles for the next dump.

This arrangement provides a completely automatic refrigeration service which the operator doesn't even have to start. The only manual functions are the change over from single to two stage operation, an occasional check of the oil level in the compressors, and the usual machinery maintenance. The operator enjoys the automatic feature, as it allows him complete freedom to attend to other plant duties.

Mobile Test Unit Collects Frozen Food Data in Processing Plants

A NEW mobile test unit has been created by the Continental Can Company to provide frozen food packers in-plant research assistance in producing the highest quality products through the most economical methods.

This "suitcase laboratory" consisting of four machines and a two-man operating team, can be set up in an area 6 feet by 8 feet, yet it carries out in miniature all the basic operations of a full-sized plant. It is made up of a recording potentiometer, an atmospheric closing machine, a gas and vacuum closing machine and a freezing unit, and was designed for quick dismantling and easy shipment, ready for on-the-spot technical work wherever it is needed.

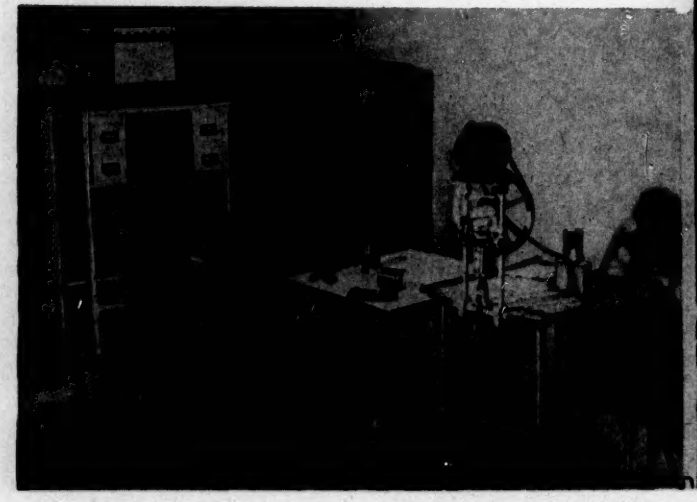
With these machines, the research team seals test cans atmospherically, with inert gas or by vacuum; attaches thermocouples to the cans for interior temperature readings; freezes test products at temperatures between zero and minus 35 F by either blast or immersion, and collects research data on automatic strip charts. By analyzing this information, the Continental men come up with answers to questions like: What is the optimum temperature and time for freezing a particular product? What size and shape container is most effective for freezing the product at its optimum time and temperature? Does pre-cooking or blanching improve the quality of the product after it is frozen? Which is the best packing procedure for the product, air closure, vacuum or gas pack?

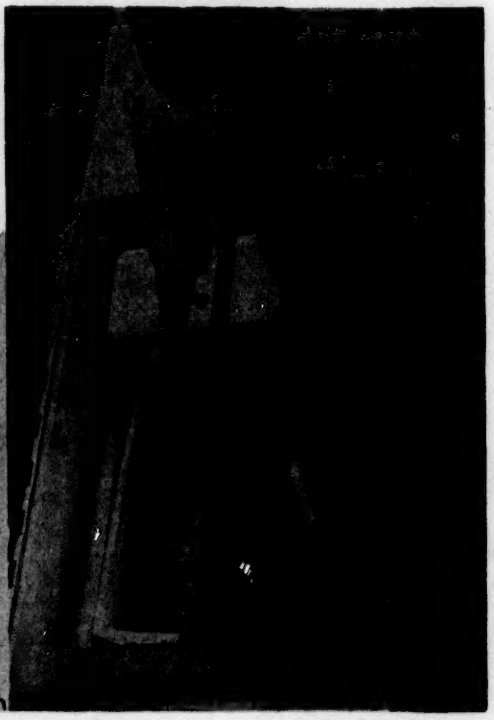
Although its career has been brief, the mobile unit has already proven itself valuable to the Continental Research Division. So far, it has been used for testing seafood on Maryland's East Shore and for tests on peas, blueberries, raspberries, blackberries, and green beans in the Syracuse area. Future plans include a trip to Wisconsin canning areas for research on cherries, lima beans and corn, and future tests on the packing of frozen apples.

Between trips the unit is kept hard at work in a corner of Continental's Chicago research laboratories, where it has been running tests on the freezing of other foods including strawberries, peaches and rhubarb.

Below: The new Continental mobile frozen food research unit set up ready for action. The unit includes (l to r) a recording potentiometer, a two-way freezing unit, data-collecting thermocouples and an atmospheric machine.

Right: Freezing unit is being filled with cans for a test run. On the left, the cans are placed in a brine solution for immersion freezing. On the right, the cans lie in the blast freezing chamber.





November 30 Cold Storage Holdings

UTILIZATION of public cooler space was 67 percent on November 30, a decline of three points from the month before. This change was greater than in 1952 but storage occupancy of cooler space was still above average for this time of year. Freezer occupancy was 81 percent by the end of November which compares with 78 percent last year and 77 percent on November 30 in the 5-year average period ended 1952.

Holdings of apples reported in storage were less than average for November 30. The 28 million bushels on hand compares with 30 million in store this time of year during the 5-year average period ended 1952 and 25 million bushels last year. Pear stocks were down to less than 3 million bushels by the end of November.

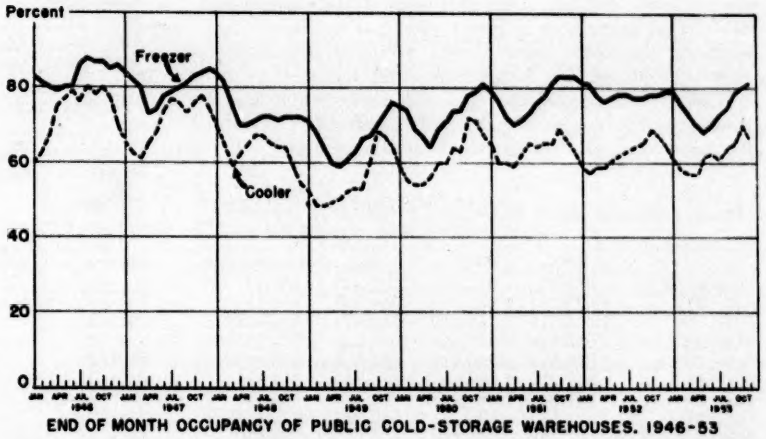
A seasonal net reduction of 12 million pounds brought national stores of frozen fruits down to less than 379 million pounds. Although this reduction was below average for November 30, it was about 15 percent greater than the net disappearance last year.

Stores of frozen vegetables totaled more than 737 million pounds on October 31 but were reduced during November to 721 million pounds. An above average net withdrawal of frozen peas (25 million vs 15 million) reduced national stores to 177 million pounds. A reduction of 9 and 8 million pounds in stocks of snap beans and sweet corn brought stocks down to 75 and 80 million pounds, respectively.

Creamery butter stocks were down to 289 million pounds by November 30— a reduction of 23 million pounds since October 31. The seasonal decline in American Cheddar cheese stocks amounted to 20 million pounds which brought national holdings down to 397 million pounds. October 31 stores of shell eggs were more than halved during November and by the end of the month totaled 134,000 cases. The 27 million pound increase which brought total poultry stocks up to almost 286 million pounds compares with a 15 million pound increase in 1952 and 38 million in the 5-year average period. Current poultry stocks were greater than average as a result of above average stocks of turkeys and ducks.

Above average accumulations of beef during November brought total stores up to 206 million pounds. This compares with 146 million on hand November 30 in the 5-year average period ended 1952 and 231 million last year when the net gain was 33 million pounds. National stores of pork totaled 266 million pounds by the end of November for a seasonal gain of 85 million pounds.

Stores of fishery products were increased during November to 201 million pounds.



END OF MONTH OCCUPANCY OF PUBLIC COLD-STORAGE WAREHOUSES. 1946-53

The pattern of public cooler occupancy has now changed from an upward cycle to a downward one. If the 5-year average pattern prevails during December, by the end of the month cooler occupancy may be as much as four points under that of November 30. Freezer occupancy should increase to a gain of about one point.

TABLE 1—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	Nov. 1953	Oct. 1953	Nov. 1952	Five Year Average
Beef	205,575	168,988	231,219	145,702
Pork	266,101	181,279	319,643	327,146
Other Meats & Meat Prod.	601,349	460,048	692,691	590,667
Frozen poultry, lbs.	285,894	259,085	294,424	262,597
Creamery butter, lbs.	288,527	311,574	83,951	96,696
American Cheese, lbs.	427,515	448,787	242,509	219,455
Other cheese, lbs.	19,923	21,787	21,263	19,369
Shell eggs, cases	134	288	393	276
Frozen eggs, lbs.	60,793	86,867	72,462	91,008
Apples, bu.	27,793	29,444	24,941	29,642
Frozen fruits, lbs.	378,676	391,021	316,757	322,994
Frozen vegetables, lbs.	721,120	737,427	569,974	447,709
Frozen fish, lbs.	179,371	176,047	210,658	174,383

TABLE 2—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC REFRIGERATED WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling Space (000 cu ft)		Nov. 1953 (%)		Oct. 1953 (%)		Nov. 1952 (%)		5-Year Average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	3,149	7,268	48	86	54	83	42	75	56	80
Middle Atlantic	31,127	38,661	69	82	74	83	71	85	68	82
East North Central	27,931	27,276	68	88	73	89	66	82	65	77
West North Central	11,094	20,339	70	77	66	74	60	67	66	73
South Atlantic	10,762	13,328	66	68	66	67	67	69	63	74
East South Central	2,486	4,191	85	81	84	81	79	89	76	86
West South Central	4,618	5,289	57	77	58	75	65	60	60	61
Mountain	1,368	4,084	56	77	61	72	63	78	60	77
Pacific	14,625	28,864	63	81	65	82	73	82	70	78
United States	107,159	149,300	67	81	70	81	67	78	66	77

Annual Report Cold Storage Holdings.

THE use of public cooler and freezer storage space in refrigerated warehouses during 1953, 1952 and 1951, and the 1948-1952 five-year average is shown in the following tables, compiled from monthly reports issued by the Production and Marketing Administration of the United States Department of Agriculture. In general, holding as a whole compared very favorably with 1952 and the five-year average, with decreases in some commodities but corresponding or better increases in others. Outstanding increases were shown by creamery butter, American cheese, and frozen vegetables, balanced by decreases in shell eggs, frozen eggs, and frozen fruits. Meats, frozen poultry, apples and frozen fish amounted to about the same totals as 1952 and the five-year average.

TABLE 1. FROZEN BEEF, PORK AND OTHER MEAT PRODUCTS (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52)	958,424	947,203	762,887	805,271
Jan. 31	1,035,244	1,081,122	959,886	958,148
Feb. 28	1,048,018	1,195,518	917,774	975,439
Mar. 31	1,179,138	1,236,834	905,946	1,756,111
Apr. 30	928,029	1,230,272	892,158	903,005
May 31	817,211	1,083,901	839,262	814,436
June 30	741,033	1,026,003	778,413	766,410
July 31	631,574	856,157	700,943	665,435
Aug. 31	537,368	693,449	605,151	550,402
Sept. 30	451,837	579,602	521,655	455,237
Oct. 31	464,355	550,965	499,293	442,679
Nov. 30	1,073,025	681,802	697,180	1,063,455

Frozen meat showed a general decrease over 1952, except November, but a slight increase over the five-year average.

TABLE 2. FROZEN POULTRY (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52)	277,357	302,144	281,601	270,988
Jan. 31	259,676	297,754	284,623	264,484
Feb. 28	217,020	269,334	242,023	233,362
Mar. 31	175,597	233,482	192,913	190,457
Apr. 30	140,432	195,100	147,203	150,360
May 31	123,695	184,238	125,359	128,670
June 30	117,687	174,461	112,369	116,595
July 31	111,876	156,438	106,692	105,910
Aug. 31	126,574	141,631	121,493	108,576
Sept. 30	175,763	182,690	166,242	146,026
Oct. 31	257,544	277,200	258,810	224,650
Nov. 30	285,894	292,694	308,366	262,597

Frozen poultry showed a decrease for each month over 1952 and a general decrease the first part of the year but an increase the last part over the 5-year average.

TABLE 3. CREAMERY BUTTER (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	72,418	26,857	105,364	60,705
Jan. 31	87,503	13,640	75,329	44,999
Feb. 28	100,817	7,663	52,507	33,863
Mar. 31	129,261	6,157	33,378	28,634
Apr. 30	152,885	10,182	32,207	34,307
May 31	193,905	30,500	42,590	55,994
June 30	253,003	69,739	72,598	96,431
July 31	311,737	98,580	104,405	130,822
Aug. 31	333,294	112,173	116,790	143,813
Sept. 30	323,693	110,571	113,501	141,447
Oct. 31	304,359	101,574	94,811	126,649
Nov. 30	288,527	80,620	59,990	96,696

Creamery butter showed a huge increase for each month over 1952 and the five-year average.

TABLE 4. AMERICAN CHEESE (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	204,224	193,323	188,519	161,067
Jan. 31	194,514	162,976	155,117	141,372
Feb. 28	185,491	141,934	137,397	126,798
Mar. 31	194,498	132,882	130,655	120,499
Apr. 30	232,593	139,436	144,441	127,822
May 31	273,610	163,460	169,553	148,800
June 30	339,062	194,094	204,009	181,522
July 31	383,715	210,263	227,199	205,245
Aug. 31	399,636	224,934	233,788	222,646
Sept. 30	425,499	228,741	239,500	226,826
Oct. 31	412,537	221,046	227,561	217,036
Nov. 30	427,515	214,356	204,842	219,455

American cheese showed a substantial increase for each month of the year over both 1952 and the five-year average.

TABLE 5. SHELL EGGS (000 CASES)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	156	149	26	128
Jan. 31	115	244	76	223
Feb. 28	248	928	159	471
Mar. 31	376	1,603	309	979
Apr. 30	827	2,185	973	1,870
May 31	1,451	3,158	2,083	3,105
June 30	1,523	3,333	2,427	3,482
July 31	1,195	2,725	2,270	3,124
Aug. 31	826	2,160	1,615	2,477
Sept. 30	495	1,692	958	1,665
Oct. 31	277	992	513	843
Nov. 30	134	388	232	276

Shell eggs remained in the doldrums, with very low holdings and decreases for each month over 1952 and the five-year average.

TABLE 6. FROZEN EGGS (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	50,497	67,833	48,655	82,308
Jan. 31	34,867	53,422	31,157	66,647
Feb. 28	42,123	59,939	32,712	69,146
Mar. 31	65,077	84,444	62,298	96,743
Apr. 30	97,321	112,125	109,253	135,712
May 31	131,255	145,489	162,659	175,637
June 30	159,683	165,865	189,980	195,641
July 31	154,284	163,833	190,818	190,939
Aug. 31	133,742	144,801	176,273	171,253
Sept. 30	110,056	121,754	151,293	146,080
Oct. 31	86,752	95,032	119,885	117,394
Nov. 30	60,793	73,004	93,662	91,008

Frozen eggs also showed decreases for every month of the year over both 1952 and the five-year average.

TABLE 7. FROZEN FRUITS (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	290,617	329,753	446,377	313,968
Jan. 31	257,775	300,743	431,711	290,181
Feb. 28	229,965	268,284	408,361	261,692
Mar. 31	189,900	235,999	245,331	226,344
Apr. 30	153,003	190,802	207,764	190,678
May 31	133,584	200,428	218,103	195,938
June 30	180,563	223,980	256,863	234,778
July 31	292,204	304,380	317,755	299,124
Aug. 31	344,763	314,912	380,264	333,463
Sept. 30	368,830	325,271	387,929	338,610
Oct. 31	388,155	322,057	384,323	338,720
Nov. 30	378,676	310,023	354,172	322,994

Frozen fruits continued this downward trend with decreases over 1952 and the five-year average until October when there was a slight pickup and increases.

TABLE 8. FROZEN VEGETABLES (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	536,504	492,909	425,279	373,619
Jan. 31	490,569	444,502	375,269	335,179
Feb. 28	448,012	397,312	328,520	297,732
Mar. 31	416,625	349,887	294,223	263,046
Apr. 30	381,587	311,643	272,111	239,119
May 31	360,990	300,492	270,206	228,061
June 30	380,611	346,031	290,321	252,847
July 31	465,129	385,474	369,311	298,018
Aug. 31	570,078	467,237	445,724	370,561
Sept. 30	675,011	524,406	515,766	431,343
Oct. 31	734,377	571,122	549,019	457,583
Nov. 30	721,120	564,822	525,223	447,709

Frozen vegetables showed exactly the opposite trend, with increases for every month of the year over both 1952 and the five-year average.

TABLE 9. APPLES (000 BUSHELS)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	20,198	22,821	33,561	25,983
Jan. 31	15,275	16,085	27,273	19,838
Feb. 28	10,810	10,805	20,135	13,796
Mar. 31	6,432	6,047	12,891	8,337
Apr. 30	3,263	2,890	6,931	4,337
May 31	1,355	1,026	2,844	1,663
June 30	597	269	680	372
July 31	123	148	294	178
Aug. 31	465	229	293	252
Sept. 30	8,231	5,615	7,684	8,145
Oct. 31	27,588	26,844	26,271	29,471
Nov. 30	27,793	25,179	27,744	29,642

Apples seemed to fluctuate up and down, the net holdings amounting to about the same as last year and the five-year average.

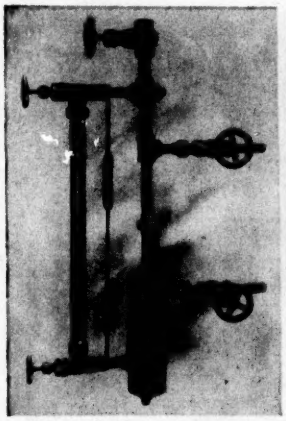
TABLE 10. FROZEN FISH (000 POUNDS)

	1953	1952	1951	5-yr. average
Dec. 31 (52) ..	195,654	192,653	158,809	151,629
Jan. 31	169,742	148,225	130,880	128,838
Feb. 28	141,378	125,772	106,834	106,597
Mar. 31	119,762	113,498	96,367	91,392
Apr. 30	109,090	113,228	88,803	84,916
May 31	110,577	123,728	105,944	100,906
June 30	141,790	146,834	127,351	122,242
July 31	165,331	175,693	181,251	143,028
Aug. 31	174,761	180,295	161,628	156,270
Sept. 30	174,322	189,208	166,100	161,167
Oct. 31	179,871	198,488	171,424	168,620
Nov. 30	179,371	209,283	178,600	174,383

Frozen fish showed a substantial increase the first part of the year, but a corresponding decrease the last part over 1952, but an increase for each month of the year over the five-year average.

Frozen Brussels Sprouts Discoloration Studied

THE heat treatment given Brussels sprouts to control enzyme action during frozen storage and distribution is, of course, complicated by the variable size of the sprouts. Like other so-called winter vegetables, Brussels sprouts are becoming more and more an important frozen food, and Western Regional Research Laboratory at Albany, Cal., has now published a study that serves a very useful purpose. It reveals the fact that "pink centers" are evidence of under-blanching and also provides a test so that freezers can be sure that heat penetration has been adequate.



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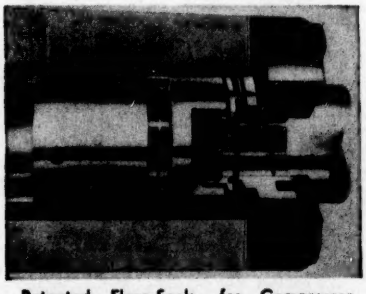

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Frozen Food Distributors Announces Benson Night

A GREAT tribute to Agriculture in the form of an impressive Benson Night will be the climax of the National Frozen Food Merchandising Convention and Exposition at the Waldorf-Astoria next February 24.

William M. Walsh, Convention Chairman, announced today that the Grand Ballroom, including two tiers of balcony boxes, will be arranged for its maximum banquet capacity of 2,200 who will assemble in enthusiastic tribute to a sound program of cooperation between government, farmers and the channels of distribution, and particularly to salute the guests of honor—Secretary and Mrs. Ezra Taft Benson.

Since this will be Secretary Benson's first address in the biggest of all consumer markets for the nation's farm products as well as in the Northeastern farm belt, the frozen food industry has arranged cooperation and will share sponsorship of Benson Night with organizations representing respectively metropolitan area distribution and farm production.

Coordinating Committee of the Food Industries, with some thirty member associations serving every food need of the huge metropolitan area of New York, will be the sponsor in behalf of the world's largest market. Joint sponsors in behalf of the farmers of the Northeast will be two of the nation's largest farm organizations: Grange League Federation and Northeastern Poultry Producers Cooperative.

"In the opinion of the leaders of our own industry with its dynamic growth possibilities still ahead," said Mr. Walsh, "these are crucial times for setting the right pattern for future understanding and cooperation between farmers and food distributors of every type. We would like to do a constructive job at this big Waldorf event to show Secretary Benson and the nation how sincerely the frozen food industry shares in and applauds honest thinking and unbiased planning.

"We certainly don't wish this year any accusation of fiddling while Rome might burn. There is no doubt that Congress will be facing all kinds of selfish pressures just when Secretary Benson will be speaking to us. We must remind our legislators that the national interest comes first and, for example that the grove owners of Florida were not saved from bankruptcy by parity formula or government loans. It was our new frozen concentrate industry, helped by intelligent government research, which has brought prosperity to those farmers, and labor-saving economy to housewives generally."

Sunday Reception

The opening general event of National Frozen Food Merchandising Convention will be the Sunday evening reception in the Waldorf ballroom February 21, according to Mr. Walsh. Panel discussions will occupy Monday, Tuesday, Wednesday and Thursday mornings. All afternoons will be left open for individual business conferences.

Formal opening of the Frozen Food Exposition at the 71st Regiment Armory is scheduled for Thursday, February 25. It will be open each afternoon through Saturday, February 27, and also evenings for the convenience of independent grocers and chain store managers. Over 45,000 square feet of display area will demonstrate the amazing strides made by frozen foods in just the last couple of years.

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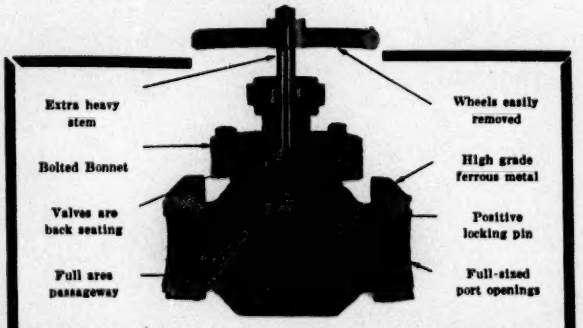

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Practical Refrigerating Engineer
NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

The Selection and Operation Of Cooling Towers and Evaporative Condensers

CY OTTERHOLM
Product Design Engineer
R. S. Dawson Co.

THE selection of a cooling tower requires consideration of a number of things, such as: the first cost of tower with necessary structure to support it and its auxiliaries; owning and operating cost of proposed water cooling equipment, taken together with the effect of temperature and quantity of water circulated on plant operating cost; the other normal questions of space cost, drift nuisance and architectural appearance. Cooling water requirements vary in accordance with plant characteristics and geographical location, providing a further and considerable range in operating performance, so that it is difficult to set down any conditions as "typical".

In order to make a practical start for this discussion, let us take a medium sized plant and assume that the load is mainly ammonia type refrigerating machines, *in long-annual-hour service*. We could then say that a typical specification might call for 3 gpm/ton (10 F water temperature range) to 5 gpm/ton which is equivalent to 6 F water temperature range between water leaving tower and water returning to the tower inlet header. The temperature of the water leaving the tower sump might well be from 6 to 10 degree *approach* to the local wet bulb temperature.

Paper presented at Los Angeles Chapter NAPRE October 21, 1953.

EXECUTIVE OFFICE, N A P R E
433 N. Waller Ave.,
Chicago 44, Ill.

OFFICERS

President, L. J. Vivien,
New Orleans 22.

Secretary, J. R. Kelahan, Chicago 44.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, an educational association.

Fig. 1—View of cooling towers where units are low, due to height limitations imposed by statutes. Author makes point that architecture and such restrictions play a part in cooling tower selection.

Specifying of circulating water temperature *range* and the cooled water *approach* to the ambient wet bulb temperature is most important in resulting tower first cost, and later, its owning and operating cost together with over-all plant efficiency. We should therefore go into these two points a bit further. The more water we circulate, the higher our pumping cost will be—but—the lower our *average* circulating water temperature becomes, for the same total heat transferred.

Further, the size—and cost—of circulating lines will be greater if water flow is increased. On the other hand, the increased rate of flow will improve heat transfer in the shell-and-tube condensers, and with the lower *average* cooling water temperature, will permit operating at lower head pressure and corresponding lower power input to system.

The determination of cooling water temperature, as it leaves the tower, similarly requires study of several angles—each having definite effect on both first cost, and later the owning and operating cost of the installation. If we specify close *approach* to the wet bulb temperature, the tower size —and cost—will be directly increased. Fan horsepower will also increase, as will the cost of supporting structure and space required. Since the variables involved do not vary at the same rate, it is best to work out at least three complete studies of your problem. Then sit down with your plant manager and show him on a *three year basis*, preferably, just what the smallest and least expensive tower installation will do to your operating efficiency for the plant as a whole. Next, point out the advantages of the *ideal* system you would like to have, calling his attention to the higher *first cost*—but actually *lower cost*—when everything is totaled up at the end of three years. You will then probably end up with an intelligent compromise in setting up your specifications.

Ideal Tower Conditions

In working out your *ideal* set of conditions, for comparison purposes, you will probably start with your natural desire to operate at maximum overall efficiency. You may decide to specify an induced draft type tower because of its lower *short cir-*

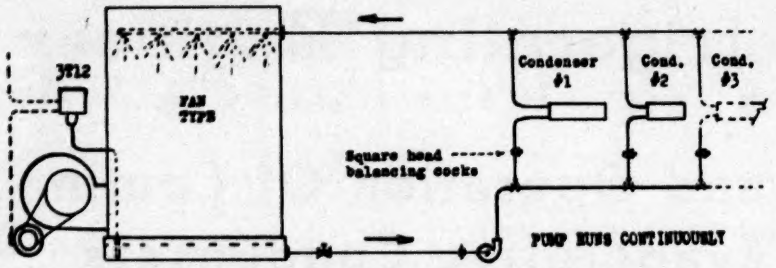


Fig. 2—Special 3T12 Penn Thermostat cycles Fan to maintain constant temperature water under varying loads and changing weather.

cutting effect. If the design wet bulb temperature is quite low in your locality, you can efficiently use wider *approach* temperature, thus keeping the size and cost of the new tower as low as practical. You will want to circulate a reasonable volume of water to secure good condenser efficiency and maximum mean temperature difference between condensing ammonia and tower water flow. The "ideal" specification for a tower to be installed in the Los Angeles industrial area might well call for 92 F condensing temperature (172 psig) with 87 F water to tower and 80 F water off, based on 72 F wet bulb ambient temperature. This range in cooling water temperature of 7 degrees means that we must circulate 4.3 gpm/ton which many authorities consider as being correct for induced draft towers under the indicated operating conditions. The 8 degree *approach* temperature to the 72 F wet bulb temperature is being widely specified and is conservative for this area, for a *long-annual-hour* plant operation. The *peak hour* condensing temperature and corresponding head pressure will result in low power bills, but it will require clean condenser surfaces. Under less than *peak hour* load and during most hours of the day—the head pressure will be considerably lower than 172 psig, of course.

First vs Operating Costs

Now, for comparison, prepare another estimate of first cost and operating costs. Use 96 F condensing temperature (about 185 psig for ammonia) and select 90 F water to tower with 80 F returning, and base tower selection on 72 F wet bulb ambient condition, as before. Now you have 10 F range in water temperatures—equivalent to 3 gpm/ton, so circulating lines and pump will be smaller—and less expensive. In some makes, tower size will drop one step, while in others there would be no change. When you have your second estimate complete, compare the difference in first cost with the difference in operating cost for the three year period. In working out this estimate you may use the old ratio of 4 psig greater head pressure as requiring 2 per cent more power and at the same time reducing capacity by 1 per cent for your system. In this case power cost would *go up* at least 6½ per cent while system capacity would *go down* 3 per cent. Maintainance cost on a system operating at the higher head pressure would be greater so that your net cost of producing one ton of refrigerating effect would go up about 10 per cent. Thus specifications to best fit your plant can be arrived at—and bids received can be properly compared.

Other Conditions Compared

In another area, having higher design wet bulb temperature, one would want to specify a tower somewhat larger to permit, say, 6 degrees *approach* to the wet bulb for the cooled water leaving the sump. Circulating water volume might be increased to 5 gpm/ton, with good economy for the system as a whole. On the other hand, a *short-annual-hour* plant such as a comfort cooling installation, using Freon-12 refrigerant, would usually be equipped with a smaller tower and water circulation would probably be reduced to the minimum of 3 gpm/ton. A specification for this type of tower is frequently 105 F condensing temperature with 95 F water to the tower and 85 F water leaving, based on 75 F ambient wet bulb temperature.

In the case of all cooling towers, evaporation and drift losses together with *bleed* should not exceed 3 per cent of water circulated. Thus, with 97 per cent of the circulated water reused, cooling towers are becoming more essential every year. Water conservation authorities will demand that our industry reduce its waste of this valuable national resource. With rising water and sewage disposal costs, towers have become an excellent investment, particularly since much progress has been made in connection with the problem of corrosion and scale deposit in recent years.

Today water treatment firms will take full charge of your cooling water system, provide the sequestering agents needed, adjust *bleed* rate to maintain a safe salt concentration in sump water, provide a change of algaecide monthly to control these living organisms, and check the pH of the system to minimize galvanic action. Chlorinated rubber and similar finishes are coming into use which have longer protective life under the most severe conditions, than the old standard finish of our industry, *hot-dipped-galvanized-after-fabrication.* Their growing acceptance will lead to lower production costs for equipment and longer useful life of cooling towers in the field, it is predicted.

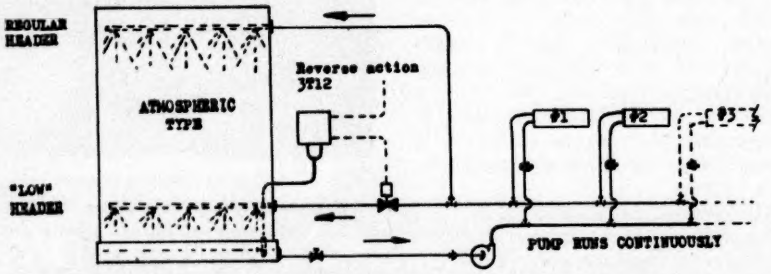


Fig. 3—Special 3T12 Penn Thermostat cycles by-pass solenoid valve to auxiliary "low" header, to control water temperature.

Water Temperature Controls

The control of sump water temperature, in the case of multiple systems, has presented a problem which has only recently been solved. The great difference in loads between a busy Saturday and the Sunday following, in the case of a modern super market, for instance, caused loss of food products and many unnecessary service calls. Then a control company brought out a special device designed to hold the temperature of the water leaving a cooling tower constant from

full load down to less than ⅓ full load. Thus head pressure of each condensing unit connected to the tower is kept constant at all times, (within the capacity of the tower). Individual water valves and their high pressure drop are eliminated with resulting lower water circulating cost. Fig. 2 and 3 shown, illustrate the method of control for both a fan type and an atmospheric tower. By use of this method, the ice cream in the end compartment will be found to be hard and in good condition every Monday morning. By supplying cooling water at the same temperature under all load conditions, the pressure drop across each thermal-expansion valve is the same at all times; thus the flow of refrigerant is not curtailed, due to low head pressure, on days when load is light. The same control method can be used with evaporative condenser systems, with equally good results.

The performance of cooling towers has improved each year. Better nozzles produce *more area per gallon of water.* Improved eliminators permit higher leaving air velocities and corresponding higher air volume, without exceeding permissable drift losses. Small towers can now be rated at 3 gpm/sq ft of net sump area while handling up to 125 cfm air flow per gallon of spray water. Split headers permit efficient handling of loads having dissimilar return water temperatures. Vibration cut-out switches protect against accidental unbalance of large fan blades. Heat exchange coils placed directly over sump or basin permit *closed-system* cooling of diesel jackets, quench oil, hydraulic oil and many process fluids.

(Discussion of Evaporative Condensers, next month.)

President Vivien Outlines Objectives

THE new year of our Association began at our 44th Annual Convention held at Purdue University. The outstanding educational program presented benefited all who attended. It is unfortunate that the majority of our members cannot attend these meetings and assimilate this wealth of information direct. The papers presented will be in Industrial Refrigeration and our Data Book during this year.

This Association was formed 45 years ago for the sole purpose of raising the standards of the operating men thru education; the programs to be class instructions, lectures, discussions of plant problems, plant visitations, and the reading and studying of papers in our trade journals and other related publications. The close association with men in your field is another method used to help one another understand some of the complex problems of plant operation.

Looking back, we know of hundreds of members who have given their knowledge, time and efforts to further the knowledge of their fellow engineers. Through their affiliation with NAPRE, and their own determination to take advantage of every means of self-improvement, many engineers are now holding responsible positions. Therefore, the fundamental requirement of a good Chapter is a planned educational program, based on the type of plants in your locality, supplemented by well rounded National educational material.

Your officers, working with the Educational Committee, assure you that excellent supplemental material will be forthcoming, and request that you take advantage of the Question and Answer Box appearing in INDUSTRIAL REFRIGERATION.

Extend Membership

The best way to educate ourselves is to help educate others. The law holds true that the greater number have more experiences and the smaller number less experiences. Therefore, it behooves us to increase our membership and knowledge.

Each existing Chapter can double its membership this year with very little effort. Check the potential of refrigerating engineers, apprentices, and those affiliated with refrigeration in the Ice and Cold Storage, Brewery, Bakery, Candy, Dairy and Ice Cream, Office Buildings, Hotels, Hospitals and other industrial plants, and you will find out that we have just scratched the surface. Contact these men, speak to management, arrange programs attractive to those you invite. Publicity of the activities of your Chapter will make known to the people in your community the aims and purposes of your Association.

Have you noticed the leaders and workers in your Chapter? They have advanced because of their interest and enthusiasm, the realization of the knowledge they have derived, and the friends they have made by their willingness to assist others. You can be a leader. At least you can lead one man into the Chapter, and with that feeling of accomplishment you will move forward. Be interested and actively participate in the work of your Association, then watch your Chapter grow, your enthusiasm increase, and the will to know more grow on you.

The members-at-large, you men who have not the advantage of the close association of a Chapter, but

Meet the New President

THE new NAPRE president, Leo J. Vivien, is an organization man, as well as a refrigeration engineer. In New Orleans, where he is employed as Executive Secretary and Examiner of that city's Engineers Examining Board, Mr. Vivien has been noted for his benevolent and fraternal work. He has just finished a term as president, District Holy Name Society, New Orleans, a Catholic Lay Group. He has been a local officer of the Benevolent Knights of America and the Knights of Columbus.

Leo J. Vivien

A member of the Engineers and Architects Club of New Orleans, the new executive is a registered professional engineer, Louisiana, and holds the highest licenses issued by New Orleans for operation of refrigeration machinery, steam boilers and engines, and internal combustion engines.

Mr. Vivien started his operating career with Gardener's and Shipper's Ice Co., becoming their Assistant Engineer in 1921. In 1925 he became Chief Engineer for Republic Ice Manufacturing Co., Inc., New Orleans. He took his present position in 1942. The new president is married, the father of two children, and makes his home in New Orleans. He has held consecutively, every elective office in the Louisiana Chapter No. 2, returning to position of Secretary again following his term as local President. With the national group, he has served as a director and in both vice-president capacities.

certainly have a faith in the benefits of NAPRE, can be of great assistance. You have a wonderful opportunity to interest other men in joining with you in the formation of a Chapter near your home. You are our ambassadors. Your officers and membership chairman subscribe to the belief that our Association can double its membership this year, and pledge ourselves to work for that goal. It will be easy if you are with us. Can we bank on your cooperation?

We have our own Annual, made up and published by NAPRE. Surplus from this production is the backbone of your National Educational Program. We plan more manuals in the near future, but at present the Operating Data Book is it. In this book we have a wealth of valuable information; you should have it near you, and make use of it.

One organization that I know of has a plan they work by, and with which they have tripled their membership and activities. It is Prayer—Contact — Work — just three little words that work wonders. Say a prayer for the success of your undertaking, make the contact and, brother, work at it. We might try it out. It brings results.

We have four very enthusiastic and capable committees: Membership, Publicity and Public Relations, Publications and Educational. They will be contacting you, and possibly needing your assistance. Be ready and willing to work. The officers and committees, in return, are at your beck and call.

Let's be twice as good this year—double our membership, advertisers, educational programs, and the part where we are most lax, our publicity. Hang your membership certificate in a prominent place. Be proud of your affiliation with NAPRE. Don't stay in a shell; take the lead, others will follow.

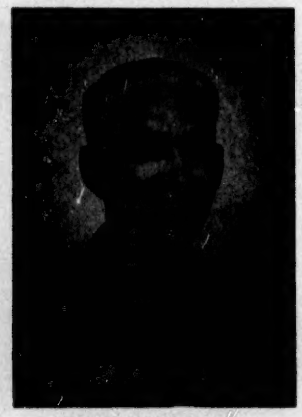
I thank all of you for the confidence reposed in me, and, rest assured, I will try to merit this confidence, and with your cooperation work toward a greater NAPRE.—LEO J. VIVIEN.

News Notes and Chapter Activities

Los Angeles

FRED HERR

DECEMBER 2 Frank Eccleston was elected president of Los Angeles Chapter, succeeding Frank Muzzy of Skazol Products. Eccleston became the 28th man to hold the office since the chapter was founded in 1922. A refrigeration engineer for the California Consumers Corp., he joined



Frank J. Eccleston

the chapter in 1939. He has served the organization vice president, as chairman of the employment committee, and as a member of the golf committee. Sports-wise, Frank is the chapter's perennial golf champion, having won top honors three years in a row.

Elmer A. Johnson, California Consumers Corp., was elected first vice-president. Others elected were: second vice-president, Clifford Scott, Union Ice Co.; secretary (re-elected) Donald H. Byl, Union Ice Co.; treasurer (re-elected) E. T. Quinn, Pacific Fruit Express Co.; sergeant-at-arms (re-elected) Donald H. Kitts, Terminal Refrigerating Co.; Board of directors: Michael Julius (chairman), Union Ice Co.; L. H. Benedict, Benedict Co.; H. R. Murray, Terminal Refrigerating Co.; Advisory Board: Frank Muzzy (chairman); Edgar M. Marrs, Union Ice Co.; and George Paulick, California Consumers Corp.

Chairmen of standing committees appointed by the in-coming president are: Educational, L. H. Benedict; Entertainment, Ed L. Nelson, Union Ice Co.; Membership, Frank G. Muzzy; Attendance, Edgar M. Marrs; Finance, William F. Losch, Frick Co.; and, Employment, Michael Julius. The slate of new officers, was recommended by a nominating committee headed by Rudi Kettler, Fairbanks-Morse Co. Installation ceremonies will be at the first meeting in January.

W. R. Burnett, chairman of the membership committee, blithely extended the Los Angeles city limits 6,000 miles west, when he presented an application from William T. Syme, refrigerating engineer, Farmers Freezing Co., Ltd., Auckland, New Zealand; and a moment later moved the limits 3,000 miles east with an application from R. Starr Parker, Cincinnati Butchers Supply Co., Atlanta Ga. Others voted into membership were: Harold Goodrich, Kingan Co., Inc., Joseph T. Tott, Associated Refrigerating Engineers, and C. T. Laughlin, California Consumers Corp., all of Los Angeles.

President Muzzy read a letter from Las Vegas, Nev., in which the chief engineers of the hotels suggested the 1955 NAPRE convention be held there. Muzzy proposed to visit Las Vegas with the idea of signing up those engineers in Los Angeles Chapter.

Dean Emerson, a member from Houston, Texas, presented a movie produced by the Dow Chemical Co., on the development of Styrofoam, a low temperature insulation material. Emerson offered comment and subjected himself to questions from the floor at the conclusion of the showing. The second part of the educational program was a quizz. Frank Elliott, Union Ice Co., served as quiz master for a group of six refrigeration experts named by President Muzzy. The program proved its popularity. The experts demonstrated their qualifications by refusing to be stumped on any question.

The program for the previous meeting (Nov. 18) was a field trip to the city's newest cold storage plant —Pacific Cold Storage, Inc. Some 90 members and guests made the trip.

Yakima Chapter

ELMER TOOP

ON December 10, Yakima Chapter held its annual Christmas Party. However, due to the blizzard that day, attendance was somewhat limited. Picture below shows the group that dared icy pavements to attend. Ray M. Straight, our president, snapped the photograph. Harry Rockwell played Santa Claus, and Luther Stewart and E. A. Wahlstrom assisted with the refreshments.

Yakima Chapter Christmas Party, Mrs. Toop and Husband Elmer, Secretary of the Chapter are the couple sitting at the left. Others are not identified.

At the November 11 meeting, members of the Yakima chapter took a plant tour of J. M. Perry Co., who manufacture ice for Northern Pacific Railroad and operate a fruit storage. The members enjoyed touring this 200 ton ice making plant and 800 car storage, one of the oldest in the Yakima area.

Members-at-Large

LEROY ETZEL

THE National Board of Directors elected the following to membership-at-large status during the past month: J. Henry Gross, Chief Eng., Sheraton-Belvedere Hotel, Baltimore, Md.; Ervol Lee Green, Ref. Engineer, A.T. & S.F. Ice Dept., La Junta, Colo.; Thomas E. Douglas, Asst. to Sales Director, William Douglas & Sons Ltd., London, England; William H. McCullough, Chief Eng., Krantz Brewing Corporation, Findlay, Ohio; and Blanchard L. Sprunger, Asst. Engineer, Continental Freezers, Inc., Lafayette, Ind.

Correspondence has also been received from: W. F. Lynch, Pacific Fruit Express Co., Omaha, Neb.; Richard J. Gerhold, Carrier Corporation, New York; Frank E. Trobaugh, Trobaugh Homestead, West Frankfort, Ill.; C. W. Harnist, Fort Worth, Texas; Clarence Broeker, Youngstown Cold Storage Co., Inc., Youngstown, New York; Louis E. Beach, Evansville Ice & Storage Co., Evansville, Ind.; O. C. Boughton, Quaker City Cold Storage Co., Philadelphia, Penna.; and S. L. Cordis, Tucson, Arizona.

We have also heard from Russell R. Ewen, North-Western Ice & Cold Storage Co., Portland, Oregon; J. Bruce Espy, City Ice Company, Denver, Colo.; Thomas D. Spencer, Idaho Creameries, Boise, Idaho; Cash Moraczewski and Samuel S. Scott, Pacific Fruit Express Co., North Platte, Neb.; Leslie G. Maness, Northwestern Ice & Cold Storage Co., Gresham, Oregon; and Reginald O. Tanner, Brooklyn, New York.

From across the seas comes mail from F. E. Hansen and E. E. Ebeling, F. C. Lovelock Pty., Ltd., Australia; John O. Mumford, Imperial Tobacco Co. of India; and Sukhlal Ratansi Gundecha, Solid Ice & Cold Storage Co., Ahmedabad, India.

Pittsburgh

OTTO KNOCH

AT THE November meeting, election of officers resulted in the same slate for another year. They are as follows: President, Louis P. Mantz; Vice Presidents James Reiter and Alois Palmeir; Sergeant-at-Arms, Alfred Lossing; and Sec'y-Treas., Otto P. Knoch.

Committees appointed are: Educational: Alfred Lossing, Chairman, Richard Conboy, Robert Neupert, George Kessel, David Jenkins; Entertainment: Thomas Knoch, Chairman, Edward Tessmer; Data Book: Otto Knoch; Membership: Edgar Kenney, Chairman, A. W. Pfeiffer, James Reiter, and Ben Dittmar. The Chapter elected another new member, Moyle C. Leddon, Aspinwall, Pittsburgh, an engineer for Fort Pitt Brewing Co., Sharpsburg, Pa.

Seattle

JIM BENNETT

AT the meeting on December 10, Ray Sollers, Industrial Lubricating Engineer for Tidewater Associated Oil Co. presented a talk on refrigerating oil. On November 12th, members Gil Hickok, Chief Engineer, and Jos. A. Soloman, Navy Pier 91, brought along a working model of the Hickok-Solomon Float Valve, which they invented and hold a patent on, and have used at their plant for several years. They had drawings, all the parts, and with these they were able to show all of the advantages.

Two new members, voted into the chapter and initiated last month were Lauren Bair, Diamond Ice & Cold Storage Co., and Bob Kime, Seattle Packing Co. Others previously initiated were Edwin John Grainger, operating engineer, Olympia Whse. & Cold Storage Co.; James A. Soloman, Refrig. Mech., USN Pier; Anthony A. Wurzer, engineer, Diamond Ice & Cold Storage Co.; Andrew Beckenbauer, engineer, New Model Laundry; and Richard K. Johnson, engineer, Carnation Co.

Seattle Chapter Ham and Beans Dinner, October 8th. Left to right, principal speaker, Bob Harrison, Rainier Brewery; members enjoying their dessert and coffee; and Frank Knowles, winner of the ham, expounding for the benefit of Fred Cornford.

Dallas

HAROLD A. KOUTNIK

ON THE first Monday in November, members of Dallas chapter NAPRE had a barbecue party in the auditorium of Alford's Refrigerated Warehouse. During the regular meeting, November 16, nominees for new officers were as follows: For president, Cecil E. Taylor, Sears, Roebuck; vice president, J. D. Sims, U. S. Cold Storage; secretary, Bill Graham; treasurer, Harold A. Koutnik; and sergeant-at-arms, George Stewart, the latter three of Alford's. An interesting report on the Purdue convention was given by Tom Weatherford. L. P. Reiss led a discussion from NAPRE'S Home Study Course.

St. Louis

KEN HOLADAY

CARBON dioxide as an important material in modern brewery practice was discussed by William E. Allen, at the November 16 meeting, St. Louis Chapter. Mr. Allen, a specialist in brewery engineering problems, described the methods of collecting, storing, and utilizing carbonic gas in the Griesedieck Brothers brewery, St. Louis. Fermentation yields over 8 lbs. CO_2 for every barrel of beer produced, he said, most of the gas being utilized in the brewery processes.

Mr. Allen described the role of refrigeration in liquefying and storing the fermentation gas, to supply the fluctuating demands of these processes which are not always in balance between the various stages of brewery operations. The main features of the system as outlined by Mr. Allen are (a) liquefaction by compression to 250 psi, then cooling by ammonia refrigeration to the condensing temperature of the high pressure gas at —8 F, (b) storage of the liquid in high pressure insulated tanks, and (c) re-evaporation in a heat exchanger for delivery back to the fermentation gas system. Other details of the system were explained by Roland Hillebrand and Ed Lotte of the Griesedieck Brothers Brewery.

Highlights of the NAPRE convention at Purdue were reviewed by President John Dabbs, who headed the St. Louis delegation. Other representatives from St. Louis attending the convention were Mr. and Mrs. Gene Kessler, Mr. and Mrs. K. M. Holaday, Jack McCarthy, and A. G. Loeffel. St. Louis Chapter President John Dabbs was named by the convention as Chairman of the National Membership Committee for 1954.

Memphis

CHAS. CONLEY

AT THE November 4 meeting of Memphis Chapter Charles A. Conley was elected Chairman of the Chapter convention delegates. C. W. Sullivan was elected alternate chairman. Other delegates were E. H. Dupuy and C. E. Stacks. Since the National President and the Delegation Chairman were both from the same firm, Conley was obliged to miss the Purdue affair. Sullivan, Dupuy, and Stacks, together with now past president Clay, reported on the proceedings at the meeting, November 18.

Educational Committee Assists Foreign Engineers

THE National Educational Committee, NAPRE, is cooperating with the Foreign Operations Administration of the Federal Government in educating practical refrigerating engineers among our allies. One of the more recent arrangements concluded was the visit of Phonge Dibavadi, Fisheries employee, Thailand Government, Bangkok, to Chicago.

Thailand Representative, Phonge Dibavadi, is pictured conducting fan test at California State Polytechnic College.

Mr. Dibavadi spent a week inspecting cold storage plants and refrigeration machinery in the Chicago area.

At Cal Poly the Thai representative is taking a special course for three months in refrigeration.

Carlson on Board of National Ice Association

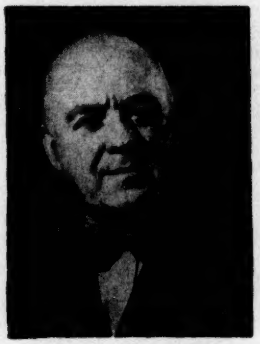
Elected recently to position of Director, National Association of Ice Industries, was A. Rudy Carlson, Past President of NAPRE. Mr. Carlson is Vice-President in charge of engineering, Southeastern Public Service Co. He was formerly Chief Engineer of

A. R. Carlson

Railways Ice and Service Co., a subsidiary of his present firm. During the past year, Mr. Carlson was Chairman of the Board of Advisors, NAPRE.

Alfred M. Reilly

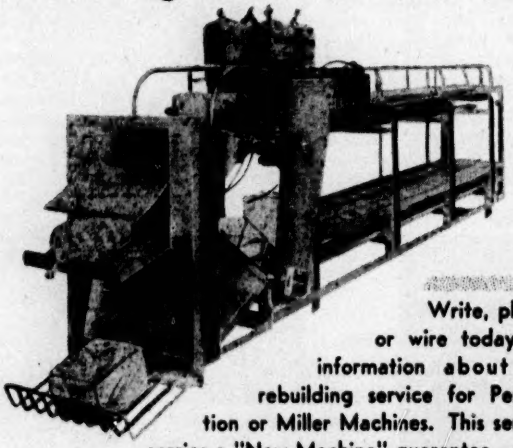
ON NOVEMBER 14, Alfred M. Reilly, vice-president in charge of sales, Burge Ice Machine Co., Chicago, passed away in his home, at Hinsdale, Illinois. Mr. Reilly, an active member of the Chicago Chapter, NAPRE, had returned only the afternoon before from the annual convention held at Purdue in honor of his friend, Professor H. G. Venemann. He had been Toastmaster at the Banquet given in the professor's honor.



Alfred M. Reilly

The late A. M. Reilly started his refrigeration career with Burge Ice Machines in Spring, 1921. In 1940, he was made sales manager, and in 1946 a vice-president.

Perfection
ICE SCORING MACHINE COMPANY



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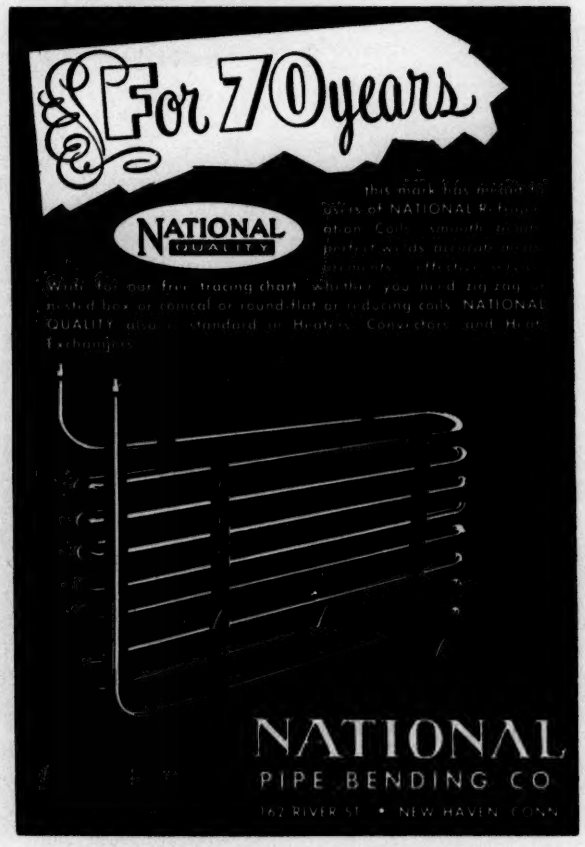

CFM vs Ton Ratings

QUESTION No. 974: For rotary type compressors, refrigeration applications, why can't we purchase these units based on cfm rather than refrigeration tonnage rates?—J.R.F.

ANSWER: It has been the practice for many years to buy and sell refrigeration compressors on the basis of tonnage capacity, so manufacturers of rotary compressors are merely falling in line with an established custom. Not every one is able to estimate the capacity of a compressor by knowing its piston displacement in cfm, even if he knows its volumetric efficiency at specified gas conditions upon entering and leaving the machine.

The Fuller rotary ammonia compressor catalog gives tonnage ratings and brake horse power requirements on 21 sizes of their compressors at suction temperatures ranging from minus 70 F to minus 20 F, and with discharge pressures corresponding to condensing temperatures of minus 40 F, minus 20 F, 0 F and 20 F. This catalog also gives instructions for making corrections in capacity and brake horse power for conditions other than normal. It also gives overall dimensions of the units direct connected or belted to motors, but nary a word is given from cover to cover about the dimensions of the cylinders or the throw of the blades which will enable one to compute the piston displacements or to check their volumetric efficiencies.

We are informed that the volumetric efficiency of these compressors is about 82 percent when operating with saturated ammonia at intake of minus 45 F, against a discharge pressure of 23.8 psig with 20 F liquid at the expansion valve. Most authorities state that the volumetric efficiencies of rotary compressors are slightly less than for reciprocating compressors at the same operating conditions. — H.G.V.

Relation of Cylinder Diameter To Wall Surface

QUESTION No. 975: A rotary compressor manufacturer states that they try to keep the diameter of the cylinder small and run to larger lengths in order to provide greater heat transfer surface through the cylinder wall. This compressor is jacketed and uses an oil coolant. It appears to me that it should be the other way around; that is, the larger the diameter, and the shorter the length of this rotary compressor cylinder, the greater the wall surface. How can I prove this? Mathematically, how can I satisfy myself as to who is correct?—R.F.K.

ANSWER: An increase in the diameter of the cylinder by any amount will give exactly the same heat transfer surface as if the length were increased a like amount. The ratio of heat transfer surface to the piston volume is not effected by a change in length, but this ratio decreases if the cylinder diameter is increased.

For mathematical proof let us assume that the ends are not jacketed, and that only a portion, say three-fourths of the outside periphery is jacketed. The heat transfer area of the cylinder exposed to the jacket fluid may be computed from the following formula:—

Area = $.75 \times 3x14\ d_1 l$, where d_1 is the inside diameter of the cylinder and l is its length.

From this equation it may be seen that the area would be increased exactly the same whether the additional increase were applied to either diameter or length.

The piston volume is the crescent shaped area between two circles of diameters. d_1 and d_2, multiplied by the length of the cylinder. The equation for volume is:

Volume = $.7854\ (d_1^2 - d_2^2)l$, where d_1 is the inside diameter of the cylinder, and d_2 is the outside diameter of the circular cam. ($d_1 - d_2$ is the maximum throw of the vane).

The ratio of area to volume thus becomes

$$\frac{.75 \times 3.14\ d_1 l}{.7854\ (d_1^2 - d_2^2)l}$$

Example: Let us assume that we have a rotary compressor with the following dimensions: $d_1 = 20$ in., $d_2 = 16$ in. $l = 10$ in. Let us first increase the length 20 percent and study its effect on heat transfer area and upon the ratio of area to volume; then let us increase the diameter 20 percent and study these same effects. In this case we will use the same maximum throw of 4 inches.

In the first case the heat transfer area and the volume are each increased 20 percent so that the ratio remains the same. In the second case the area is increased 20 percent, or from 471 sq. in. to 566 sq. in. But the volume is increased from 1131 cu. in. to 1382 cu. in. and the ratio of the area to volume decreased from 0.5045 to 0.409.

If we increase the diameter 20 percent and make the throw 5 inches instead of 4 inches the ratio of heat transfer surface to volume displacement is 566/1690 or 0.335.

Thus we have proved our original statement that an increase in the diameter by any amount will decrease the ratio of heat transfer surface per cu. in. of piston displacement. This is another way of stating that an increase in the diameter will decrease the ratio of heat transfer surface per ton of refrigeration. Whereas an increase in length of piston will not effect this ratio.

("I am not so sure that jacketing any compressor when taking in low temperature gas is a good thing to do, unless it is jacketed with a very cold fluid. It is quite apt to superheat it too much thus reducing its true or overall volumetric efficiency.)–H.G.V.

N A P R E

Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Ind.

Ice Storage Construction

QUESTION No. 976. What improvements have been made in the design of rooms or buildings for storing ice to be used on passenger trains? What modern materials are applicable in construction of such facilities? Explain.—M.H.D.

ANSWER: To the best of our knowledge and consistent with information in our files, we cannot say that there have been any substantial improvements made in the storage structures or buildings used for storing ice along railroad right-of-ways. Ice for air comfort systems on passenger trains has declined in use with the advent of more and more mechanically cooled cars. Therefore there has been no demand for any improvements in the structure of such facilities. The little ice that is needed is usually purchased locally or supplied at way points on the railroads from commercial ice houses established by refrigerated car operators or railway service concerns.

For the most part ice storage houses existing today, even of fairly recent construction, are generally timber structures. Insulation in walls and ceilings has been loose-fill types of insulation and floor insulation has been board form types that will support considerable weight. On some buildings insulation has been placed over roof rather than over a false ceiling. Also in some rare instances, some minor improvements have been made in the cold storage doors, both for access and delivery.

As for modern materials applicable, we do have information on some ice storage houses of recent construction that utilized re-enforced concrete. New types of insulation materials, for the most part, have not been applied to ice storage houses found along railroad right-of-ways due to the fact that they are not quite as economical to obtain and install as the materials that have been traditionally used by these firms. Generally, the newer types of materials required a more permanent type of structure to retain them.

Had your questioner asked for mechanical improvements, I sincerely believe that we would have been able to come up with a much better answer and give quite a list of changes from the old manual operated plant to the new automatically operated and controlled jobs existing today.—J.R.K.

Fractional Hp Motor Headache

Question No. 977. I have a 1/6 hp Delco, 120 v, one phase motor, belt driving the compressor on Kelvinator in the Boss' office. This motor is a rebuilt job, the second in as many years. The motor starts across the line and apparently has some sort of starting winding built in, for the brush rigging is moveable and appears to energise a portion of the motor on starting, then move to another position on running.

Now this motor is beginning to act up. When the thermo-switch cuts it across the line, it dims all the lighting in the office to the point where I think sure the fuses will blow, then clears up and repeats at least two more times before humming right along normally.

The refrigeration system is in first class shape and the box holds temperatures. I think I'm about to lose my third motor and don't know why. Any suggestions?—F.L.B.

ANSWER: The motor you describe is undoubtedly a repulsion-start, induction run motor. The motor starts with short-circuited brushes in contact with the commutator and accelerates along a speed-torque curve corresponding to operation as a repulsion motor. Normally at about 70 percent of full speed a centrifugally operated device presses a short-circuiting ring against the commutator bars and then lifts the brushes. The motor then runs as an induction motor along a different speed-torque curve than that previously followed. Normally the transfer point is at a speed for which the torque as an induction motor is greater than that as a repulsion motor.

The fact that your lights dim when the motor starts might be due to inadequate wire size. It might also be due to the fact that the brushes are set improperly so the motor draws an abnormally large current and yet produces less than normal starting torque. A third possibility is that the motor is slightly small for the application and does not have enough excess torque at the switching speed to make a positive transfer. Since you have had trouble with three motors, it seems most likely that either the first or the third of these possibilities, or a combination of them, is the source of your trouble.—Geo. V. Mueller, Purdue.

Freon-Oil Affinity

QUESTION No. 978. I understand that Freon 12 has great affinity for oil. What maximum oil concentration (percent) can be expected in a system at 40 F evaporating temperature, at 0 F, and at minus 30 F? Any information available on oil pickup in other freon gases?—A.J.B.

ANSWER: Freon 12 and mineral lubricating oil used in refrigeration are miscible in all proportions down to at least minus 80 F., the lowest temperature at which we have conducted specific tests. There would not be a "maximum concentration" of oil in Freon 12 therefore, if the questioner is looking for that concentration where a two layer system would be formed. Freon 12 and oil do not have a two layer system as do, for instance, Freon 22 and oil at temperatures below 0 to 10 F.

Curves are available showing vapor pressure of various mixtures of oil and Freon 12 at 40 F, 0 F and minus 30 F. A tabulation of vapor pressures for various percentages of oil in Freon 12 at these temperatures is shown in the table.

APPROXIMATE VAPOR PRESSURES; FREON 12 AND MINERAL OIL MIXTURES

Temperature	Pure F-12 USIA PSI	10% Oil PSI	20% Oil PSI	30% Oil PSI
40 F	5.17	50.5	49.5	48
0 F	23.9	23.5	23	22.5
-30 F	12.	11.8	11.5	10.6

—A. H. Lawrence, Jr., Dupont.

Brine Fire Extinguishers

QUESTION NO. 979: What mix should I use in my fire barrels with which our plant equipped in addition to hand extinguishers? I have been assigned the task of refilling these barrels.—F.N.

ANSWER: Because calcium chloride, when mixed with water is an excellent fire protection medium at all temperatures, it is recognized as a simple and efficient method for extinguishing fires.

Simply mix five pounds of calcium chloride to each gallon of water to prepare a solution of calcium chloride which will be freezeproof in temperatures as low as 60 degrees below zero F. This solution may be prepared and stored in 50 gallon drums. They should be covered, and a standard fire bucket may be used to dispense contents in the event of fire.—CCN.

New Questions

Ice Tank Stop-Leak?

QUESTION NO. 980: Our ice tank has developed a slow leak. Can you give us any information as to what we can put in the tank to stop this leak? At one time there was a firm who advertised material for this purpose.—R.W.C.

Disintegration of Ice Conveyor Sprocket Teeth

QUESTION NO. 981: The excessive wear and short life of some manganese bronze sprockets and steel chain on an ice-conveyor were discussed, but no conclusion could be drawn for lack of sufficient information and data. Some suspicion was expressed

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DETROIT ICE MACHINE COMPANY

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DIMCO Evaporators in a Frozen Food Storage Room at Great Lakes Terminal Warehouse, Toledo, Ohio. A typical installation facilitating palletizing.

that the foundry may have slipped up on the ingredients or proportions when casting the sprockets, while others questioned whether wear or stretch in the chain may not be responsible for the chain riding near the tips of the teeth and eating away the sprocket teeth.—A. F. Donels.

Ice Adhesion Preventative?

QUESTION NO. 982: Do you know of a material or coating which when applied to a refrigerated surface, such as copper, will eliminate or at least minimize the adhesion of freezing water (ice) so that it can be removed under slight pressure? In our case the freezing surface is constantly kept cold and cyclical thawing is impractical.—T.K.

Converting Ice Plant For Vacuum Cooling

QUESTION NO. 983: In the September issue of Industrial Refrigeration, on page 22 you ran an article about Chill-Vac process of speedy chilling of Lettuce as practiced in Salt River Valley by Crystal Ice & Cold Storage, with retorts and engineering by Gay Engineering Corp. of Los Angeles.

In the pictures accompanying the article I see what looks like a row of sliding-vane type blowers which are operating to evacuate the retorts. Mention is made of a two-stage pumping unit, perhaps implying two such blowers hooked in cascade or series operation.

I have heard it rumored from unknown sources that this type of vacuum chilling can be accomplished effectively by using standard ice-plant equipment. My informant seemed under the impression that the entire ammonia circuit could be used interchangeably either for making ice or chilling lettuce.

I am under the impression that my informant is probably badly mistaken. My guess is that perhaps they may have cut the compressors out of the ammonia cycle temporarily, and perhaps used them for pumping air and water vapor to evacuate the retorts. But what effect that would have on the operating of the ammonia compressors I'd hate to guess.

Have you come across any literature on the subject that would throw light on this phase of the problem that you could refer me to? I have one obsolete Vilter Pakice plant that is going begging down here, and another can-ice plant that is getting less and less business due to changing vegetable packs, and we would be delighted if we could use at least the compressors for vacuum chilling of leafy vegetables. Any helpful information you can give me will be greatly appreciated.—AFD.

Brine Surge Tank And Vent Connections

QUESTION NO. 984: We have a calcium chloride refrigeration system in one of our cold storage buildings. The surge tank on the roof is connected with the feeder line. Our engineer is under the impression that this tank should be connected with the return line.

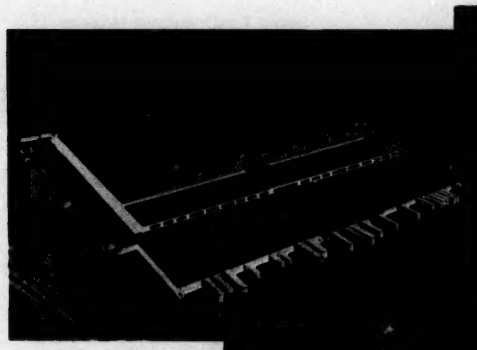
We also have an air outlet in another section of the building that extends from the return line on the top room. Should this line be in the return or feeder header?—L.A.W.

Power, Storage and Charges

QUESTION NO. 985: How much frozen food as the general run can be placed in a plant containing one million cubic feet, being divided into two equally spaced rooms, having 23 ft. ceiling, being stored by fork trucks on pallets and having sufficient room for aisles? Naturally, I realize these would be approximate figures.

With the proper insulation, this will require approximately 200 tons refrigeration. If the power rate is ¾ cents kw, what should the average annual power bill be for this part of the country (Eastern Seaboard)?

I would also like to know the freezer storage rate for this location and the handling charge.—W.H.B.



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Expansion Program Modernizes Dairy Plant

(Continued from page 17)

green and cream tile with black trim. The floors are of sun-tan colored tile and incombustible sonofaced ceiling board has been installed in ceiling areas on a suspended aluminum grid system. The ceiling board which has a high thermal efficiency and reduces noise, has a plastic facing for ease of maintenance. Fiberglas form boards were used to provide an incombustible roof deck.

Four inch thicknesses asphalt-enclosed board is contained in the walls of the cold storage room and four inch thicknesses of asphalt-enclosed floor board was installed in floor areas.

Exterior of the one floor addition is of buff brick with stone trim. Black vitrolite glass is used to face the space between window openings.

Smith, Kratz and Strong of Urbana, Illinois was the architect and W. J. Schernekau of Robinson, Illinois was the general contractor. Dairy engineers from St. Louis assisted with the design and equipment layout.

Refrigeration Installation

(Continued from page 20)

system is based on handling 100,000 pounds of product brought in at an average of 45 F., daily. In addition, 60,000 pounds can be quick frozen in the blast freezing section where temperatures are brought down to minus 30 F.

The automatic system was engineered and installed by Felix W. Powers of Powers Refrigeration, Inc., Carrier ammonia refrigeration dealer in Los Angeles, California.

Fairmont Foods Expands

PURCHASE has been announced by the Fairmont Foods Company from North American Creameries, Inc., of its ice cream business in North and South Dakota and Northwestern Iowa. The purchase according to D. L. Howe, Fairmont president is in line with the company's policy to consolidate trade territories. North American personnel in the area, and brands and packages will be continued.

Fairmont processes and distributes butter and other dairy products from 74 branches in 26 states.

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The Case of the Contented Engineer

By Howe . . . The World's Chiller

John Q. Engineer was pleased with his old refrigeration system. Been giving him pretty good service . . . off and on. Of course, the cost of operating it was going up, but what expense wasn't? Had some downtime lately, but then you have to expect that, too!

Then one day, a Howe "private eye" detected the trap that "J. Q." was walking into, and pointed out those unseen losses that were robbing him of his real profits. He showed him how to cut the risk of spoilage, assure better production, keep his products at their perfection peak. By providing exact temperature and humidity control at *all* times with Howe tested equipment, "J. Q." soon realized his obsolete, inefficient system had been robbing him *cold*.

He also realized that his new Howe kept running longer, with less trouble. "They're designed for that from the start, backed by 42 years' specialization," said the "private eye," departing for his next case.

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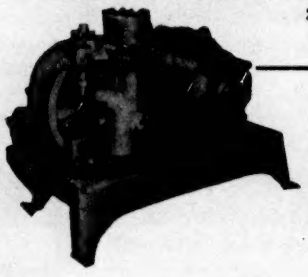
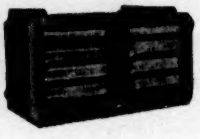
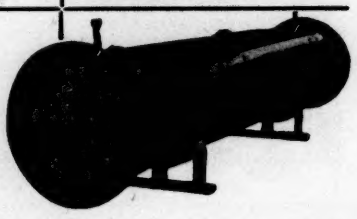


CONSULT HOWE on all your refrigeration problems. Since 1912 manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment. Immediate delivery!





Packaging Sized Ice Per Bushel or 50 lbs.

THE question of whether or not the bushel is a better unit than 50 pounds for sized ice is something that should be quite well considered by any one who has not already established this for themselves, is a recent comment by a Northwest ice man. In Portland, he says, they use bushels; this was established many years ago and it was done because in one of the bulletins put out by the National Association about the time sized ice was first begun, the advice was given to use the bushel rather than the 50 lbs. They have found that there are no objections to the bushel unit and many advantages.

A bushel is a volume measurement and it is the same quantity in bulk, which means that every bag is the same size regardless of the particular size of ice that is in it. The actual weight of a bushel of ice will vary as much as six pounds depending on the kind of ice that's in it. The coarser the crushing and the lesser the amount of fine ice, the lighter it will be. If the 50 pound weight is used as a unit, either you are putting out bags that weigh much more than 50 pounds in the finer sizes of ice or you are putting out uneven sized bags. In Portland they like the bushel system—they think it is better than 50 pound units.

Unit Secretaries Hold Annual Meeting

THE unit ice association secretaries held their annual get-together and luncheon at the annual ice convention in Washington. The program was informal, with reports from the various sections, and short talks by representatives of the National Association.

Dick Florrid, secretary of the Georgia association and Southern Ice Exchange was elected president for the coming year and R. N. Milling, secretary of the Delta States Association was elected secretary-treasurer. They succeed Miss Muriel Washburn of Florida and Mrs. Edna Vaughn of Delta States.

New Company Chartered

CHARTER of incorporation has been granted to Farmers Ice and Produce Inc., Hattiesburg, Miss., listing capital stock of $75,000.

Illinois Association of Ice Industries Conference

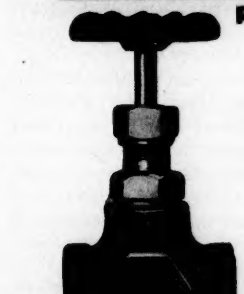
THE Fall conference of the Illinois Association of Ice Industries held at Decatur, December 10, attracted a satisfactory attendance and the interest in the discussions indicated that much thought had been given to the subjects on the agenda. A spirit of optimism was evident and the men at the head of Illinois ice companies approach the 1954 season with optimism. Guy W. Jacobs, Secretary of the National Association of Ice Industries was present and spent the day with the group.

Among the subjects covered in the agenda were processing ice, vendors, truck icing, car icing, hydro-cooling, distribution, production, sanitation, safety, advertising, promotion and merchandising.

Ice Plant Sold

THE Crystal Ice Company of Ironton, Ohio, organized in 1888 and the City Ice Delivery Company of Huntington, West Virginia, have been purchased by Emery E. Morgan and Stanley Morgan of Huntington, to operate as the Crystal Ice & Storage Company.

shank AMMONIA VALVES AND REFRIGERATION PRODUCTS



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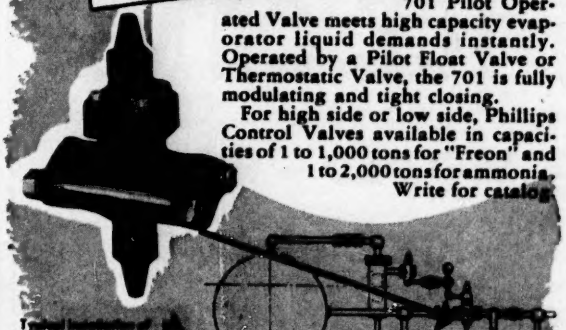
The Phillips No. 701 Pilot Operated Valve meets high capacity evaporator liquid demands instantly. Operated by a Pilot Float Valve or Thermostatic Valve, the 701 is fully modulating and tight closing.

For high side or low side, Phillips Control Valves available in capacities of 1 to 1,000 tons for "Freon" and 1 to 2,000 tons for ammonia. Write for catalog.



Typical Installation of Phillips No. 701 Pilot Operated Valve.

For Engineering advice—willingly given—call on Phillips.

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S&S ICE VENDING STATIONS
and Ice Vending Equipment

AUTOMATIC!
REFRIGERATED!
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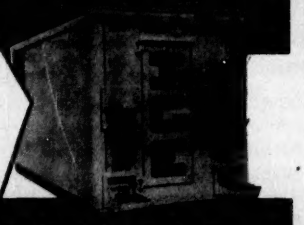
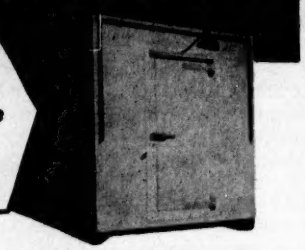


S&S Frozen Food & Ice Cream
STORAGE DEPOTS

For Independent, Outside Refrigerated Storage! . . . Complete Ready to Plug In! Portable!



Slash distribution costs . . . add frozen food profits for chain stores and super-markets!

Sold by Leading Ice Equipment Distributors Throughout the Nation

S&S VENDING MACHINE COMPANY
670 Lincoln Avenue San Jose, California

OHIO
SPECIAL
ICE CANS

WELDED — RIVETED

ICE CAN GRIDS

Industrial Trucks
and Trailers

THE OHIO GALVANIZING & MFG. CO.
NILES OHIO

Plant Maintenance and Engineering Conference

CONFORMING to the wishes of maintenance executives and other plant operating personnel, the Fifth Plant Maintenance and Engineering Conference, Chicago, Ill., provides for as many small-group gatherings as possible. There will be 20 round table discussions, each to be held twice. There will be 11 sectional conferences, of which four will be repeated and one continued, giving a total of 16. By this method of subdivision, participants will be enabled to do a better job of concentrating on specific subjects.

Elimination of the banquet has enabled the management to continue to have three general sessions, but with one less evening session. The third general session this year is an innovation. During the two hours assigned to it, a panel of this year's speakers, conference leaders, and chairmen will answer as many as possible of the questions that may not have been answered at the sessions. If time permits, the panel will dip into the question boxes which have been provided to receive questions that delegates may have failed to present at meetings, or which concern themselves with questions not taken up by the speakers and discussion leaders. If there are questions left over they will serve to indicate subjects that may be appropriate for the next Conference.

Headquarters hotel for the Conference will be Conrad Hilton, Chicago. All conference sessions will be held there except general session on Wednesday evening which will be held in the 8th Street Theatre adjacent to the Conrad Hilton Hotel. General sessions will be held in the Grand Ballroom. Location of each sectional and round table session will be posted in the conference registration area in the Ballroom Foyer.

The exhibits will be at the International Amphitheatre, Union Stock Yards. There is no registration fee or charge for admission to the show. Registration fee for the complete conference will be $20.00.

The opening session will be held Monday morning January 25 with a discussion of planning and scheduling maintenance work. Monday evening sectional conferences will be held on various aspects of maintenance.

Tuesday will be devoted to round table discussions and sectional conferences with a morning and afternoon session.

Wednesday morning a general session will be held on Maintenance Cost control and budgeting and at an afternoon session round table discussions will be continued. Wednesday evening the conference will be concluded with a general session, with a panel discussion constituting a round-up of answers to all questions unanswered at the preceding general sessions and sectional meetings to the extent that time permits.

Vacuum Cooling Increases

SHIPMENT of lettuce cooled by the new vacuum method will probably run to a total of 15,000 cars from California and Arizona during the present season. Advantages are the rapid cooling and use of fiberboard cartons and field packing, since no icing of crates (only bunker ice) is required. Only lettuce has been vacuum cooled commercially, but it seems possible to extend the method to other leafy and thin-skinned products. For example, such products as broccoli, cabbage, Brussels sprouts, asparagus, leeks, mushrooms, corn on the cob may cool satisfactorily, but apples, tomatoes, cauliflower, celery, potatoes and oranges do not cool well by this method.—TRRF Information Bulletin.

Ice Cream Production Increases

ICE CREAM production in the United States, estimated at 46,240,000 gallons for October, was six percent larger than a year ago and was nine percent more than the five-year, 1947-51, average for the month, the Bureau of Agricultural Economics reports. For the second consecutive month, production was at the highest level for the respective month since 1947. From September to October, output declined 18 percent, compared with a similar drop of 18 percent a year earlier and an average decrease of 20 percent between these months during the 1947-51 period. October weather this year was generally favorable to ice cream consumption. In the first 10 months of 1953, ice cream production totaled 531,930,000 gallons, two percent more than in the same months of 1952 and four percent more than the January-October, 1947-51 average. The butterfat content of ice cream made in October averaged 11.6 percent for the country as a whole, the same as in the previous month and also the same as in October 1952.

Production of ice cream this October, when compared with October last year, was larger in all sections of the country except the South Atlantic and the West. Output was up seven percent in the North Atlantic States, where the gains were only six and seven percent, respectively, in New York and Pennsylvania. The increase in the West Central Region was eight percent, with all states there having increases except the Dakotas, where production held about steady. Output was up 15 percent in the East North Central Region and 18 percent in the South Central, where the gains were considerable except in Texas, Oklahoma and Illinois. Changes in the South Atlantic Region were mixed but that section as a whole had a loss of three percent. Production was off 10 percent in the Pacific States, although California's decrease was only six percent. The Mountain States showed the sharpest loss from a year ago, 15 percent. Compared with the October 1947-51 average, ice cream output was larger in all regions, the gains varying from two percent in the Mountain States to 14 percent in the East North Central.

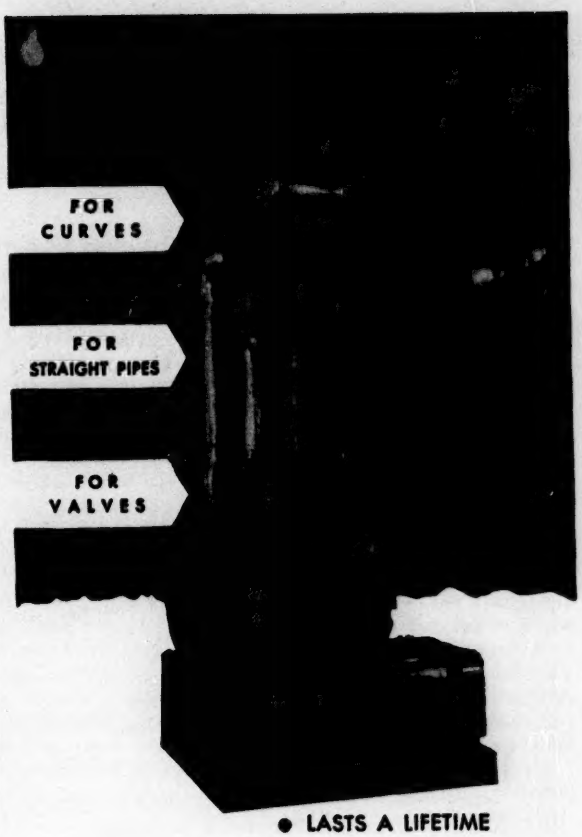
Truck Icing Information

THE Indiana Association of Ice Industries, cooperating with the Illinois Association, plans to make available to vegetable truckers information regarding location and type of service available from Indiana and Illinois Ice companies. The movement of perishables has become big business and the demand for truck ice has followed this trend in the shipment of such perishables. It is believed however that considerably more ice could be sold to truckers if facilities for such icing were improved and knowledge of such facilities were made available to all truckers.

60th Annual Meeting ASHVE

THE 60th annual meeting of The American Society of Heating and Ventilating Engineers will be held in Houston, Texas January 25-27, 1954. Plans for the meeting, at which a total of 13 technical papers will be presented at four sessions, are now complete according to D. M. Mills, general chairman of the Committee on Arrangements for the South Texas Chapter.

Topics to be covered in the sessions include cooling towers, automobile air conditioning, panel heating and controls, the heat pump, the availability and utilization of solar energy for heating, air jets, room air distribution, a new type radio-meter, residence cooling and heating.



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OZITE All-Hair Felt has been the best insulation for the refrigeration industry for over half a century. Here's why —

. . . low conductivity provides efficient heat barrier . . . allows close temperature control . . . permits maximum capacity of refrigeration units . . . reduces power consumption . . . does not rot or pack down — resists fire.

For all of the facts about time-proven OZITE send for 4-page Bulletin No. 300.

AMERICAN HAIR & FELT COMPANY

Dept. L-212, Merchandise Mart

Chicago 54, Illinois

Handling Frozen Foods in Retail Stores To Highlight Convention Program

RESULTS of an intensive study of the handling of frozen foods in retail food stores, both service and self-service, will be unveiled by the U. S. Department of Agriculture at the National Frozen Food Convention, which will be held at the Hotel Commodore, New York, January 31-February 3, it was announced by M. K. Spiegl, president, Spiegl Farms, Salinas, Calif., and president, National Association of Frozen Food Packers, sponsors of the event.

Industry Luncheon

It was also announced that an industry luncheon will, for the first time, consist solely of prepared and specialty frozen foods. This will enable frozen food brokers, distributors, supermarket and chain store operators, executives of cooperatives and voluntary buying groups and independent retailers to sample the new foods which now comprise such a large portion of the sales volume.

The luncheon is one part of "The Greatest Frozen Food Show on Earth," a series of exhibits devoted exclusively to prepared and specialty frozen foods. Arranged in a series of tent-like displays, the booths will have heating and serving facilities to permit buyers to sample each product.

Frozen Food Handling

Vail L. Anderson, marketing specialist, of the Agriculture Department will deliver the report on frozen food handling in a session on "Better Operation—People and Methods."

The study was undertaken by the market research division of the Production and Marketing Administration to determine how retail food stores could increase labor productivity, reduce costs through improved methods, equipment, materials, and layout of frozen food departments. The research is being conducted in cooperation with four supermarket organizations in the eastern part of the country. Time and motion studies are being made and current methods of handling are being examined.

In addition, various improvements have been developed and they are being field tested in the stores of the four cooperating chains. The tests will have been completed in time for the report.

The research covers the movement of the product from the time it arrives at the back door of the store until it is placed in the show case. Comparisons are being made between methods of stamping prices in the back room and at the display case. Also being evaluated are the use of walk-in freezers, Shamrock containers and methods of inventory and record keeping.

Aids to Retailer

"We confidentially expect that this convention will prove a landmark in the progress of the frozen food industry," Mr. Spiegl declared. "Never before have such efforts been made to aid the retailer by providing market knowledge, help in cutting costs, and expert aid in his selection of products for merchandising. This cooperative approach between the packers on the one hand and retailers on the other is certain to result in greater profits for the industry as well as improved service to the consumer."

Registration cards and hotel reservations may be obtained from the National Association of Frozen Food Packers, 1415 K St., N.W., Washington 5, D. C.

The ARMSTRONG *forged steel* PURGER

KEEPS REFRIGERANT SYSTEMS FREE OF NON-CONDENSABLE GAS

- Reduces Head Pressure
- Saves Power
- Saves Refrigerant
- Saves Work
- Increases Capacity
- Saves Water

EACH four pounds excess head pressure caused by air or other non-condensables increases compressor load and reduces its capacity by approximately 1%; increasing power cost about 2%.

An Armstrong Purger stops such costly operation. It is a simple, dependable mechanism which eliminates air from refrigerant, bringing you these benefits:

1. Reduced power costs
2. Labor and time saved—no manual purging
3. Full capacity operation
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5. Excessive pressure stresses reduced
6. Helps prevent "ammonia" explosions

Free Bulletin No. 221 tells how you can save with an Armstrong Purger; sizes, prices and selection data given. Send today.

LIQUID SEALS

ARMSTRONG LIQUID SEALS are easily installed. They keep high pressure refrigerant gas out of the evaporator if the liquid level in the receiver drops below the outlet pipe. Proven Armstrong inverted bucket design means long dependable performance. For pressures to 600 lbs.

FREE Liquid Seal Bulletin, No. 241, giving complete data and prices. Send now.

PURGERS AND LIQUID SEALS ARE GUARANTEED TO SATISFY

ARMSTRONG MACHINE WORKS 860 Maple Street, Three Rivers, Michigan

Air Conditioning Railroads in India

THE Government of India is considering a plan for introducing air-conditioned accommodation on all the principal railway routes in the country for the benefit of foreign tourists visiting India. This was disclosed by the Union Minister for Railways and Transport, Lal Bahadur Shastri, in Bombay while inaugurating a conference of The Asian Automobile Associations.

He assured delegates and representatives of seven Asian countries attending the conference that the Government of India was doing and would continue to do everything possible to promote and develop all possible facilities to tourists.

Mr. Chastri said that already air-conditioned accommodations are available on the trains connecting the cities of Bombay, Delhi, Calcutta and Madras. The internal coach work and fittings of the passenger trains are being improved. Special tourist coaches are available which are really "homes on wheels" by which tourists can travel in groups without having to go to hotels for overnight stay in the places they visit. Most of the railways have seasonal concessional fares for travel to hill stations.

New Frozen Food Warehouse

A NEW refrigerated warehouse is under construction at Miami, Fla., by Griffith Veldo, Inc. The new plant will have a capacity of approximately four million pounds of frozen foods.

Shipments will be received on a private railroad siding on the north and worked through the plant in a straight line operation to the shipping deck on the south. Construction is expected to be completed and the plan in full operation this Fall.

COMING CONVENTIONS

MISSOURI VALLEY ICE MANUFACTURERS ASSOCIATION
January 11-12, 1954
Hotel President, Kansas City, Mo.
A. V. ESPHORST, Secy-Treas.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
January 25-27, 1954
Rice Hotel, Houston, Texas
H. V. HUTCHINSON, Exec.-Secy.

PLANT MAINTENANCE & ENGINEERING SHOW AND CONFERENCE
January 25-28, 1954
International Ampitheatre, Chicago, Ill.
Conrad Hilton Hotel, Chicago, Ill.

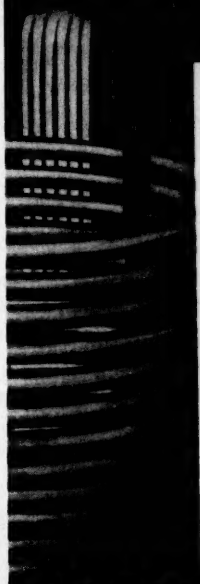
NATIONAL ASSOCIATION FROZEN FOOD PACKERS
January 31-February 3, 1954
Hotel Commodore, New York, N. Y.
M. K. SPIEGEL, President

NATIONAL FROZEN FOOD MERCHANDISING CONVENTION AND EXPOSITION
February 21-25, 1954
Waldorf-Astoria Hotel, New York, N. Y.
WILLIAM W. WALSH, Chairman convention committee

NORTH CAROLINA ICE ASSOCIATION
March 8-9, 1954
Sir Walter Raleigh Hotel, Raleigh, N. C.
LEWIS W. POWELL, Secy.-Treas.

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 2-4, 1954
Roosevelt Hotel, New Orleans, La.
J. RICHARD KELAHAN, Secretary

PIPE BENDING EXPERTS



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From coils of ¼-inch copper up to 6-inch extra heavy in all metals, even stainless steel, our master metalworkers can exactly reproduce your specifications. Complete welding facilities. More than 25 years' specialization assures you of fine quality custom.

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Monarch MODEL 50

Bateman *All-Steel* ICE CRUSHER

The Bateman all steel MONARCH Model 50 Ice Crusher is galvanized for the prevention of rust. Slanting hopper for easy loading, with shelf for placing ice on before entering crusher. Hopper opening — 12½"x15". Uses 1 HP. motor with V-belt drive. All moving parts move on either ball or roller bearings. Gears are of alloy steel hardened for long life and trouble free. Steel shell, legs, grates, grate handle and alloy steel teeth. Belts and pulley furnished when crusher is ordered without motor. Side plates and bottom of hopper 3/16" steel. Price $235.00, less motor. Motor at prevailing price.

Write For Details
Mineral Wells, Texas

Bateman *Ice Processing Equipment*

Warns Against Corrosion Damage to Air Conditioning

COSTLY air conditioning equipment can be reduced to junk in only two or three years by corrosion damage. Proof of this statement was presented by Henry L. Shuldener, president of Water Service Laboratories, Inc., a water treatment servicing organizations, at the opening of a new section of the Corrosion Research Exhibit maintained at the Laboratory's main office, 423 West 126th Street, New York City.

"Cooling water, circulated through the cooling towers, evaporative condensers and air washers of air conditioning systems, is even more corrosive than ordinary water, since it repeatedly absorbs corrosive gases from the atmosphere as it is sprayed," Mr. Shuldener pointed out. "Spray nozzles, with their small apertures, are particularly vulnerable both to corrosion and clogging."

Among the new exhibits of corroded air conditioning equipment are a cooling tower discharge nipple which corroded and dropped off after only six months of operation, a section of air washer tubing which was completely blocked by corrosion products in nine months, a spray head from an evaporative condenser which clogged and corroded off in only three seasons of operation and a brass sprinkler nozzle with its hole opened to several times normal size by dezincification.

The exhibit also includes a series of active research set-ups simulating cooling water systems, which graphically demonstrate the action of treated and untreated water on the various metals used for this type of piping and equipment.

"The problems of scale formation in hard water areas are as serious as those of corrosion in soft water areas," Mr. Shuldener continued. "Scale deposits not only clog piping and nozzles, but seriously reduce the efficiency of heat transfer surfaces."

Mr. Shuldener also emphasized that water problems exist in chilled water circulating systems for air conditioning, in spite of the fact that these are generally regarded as closed systems. Corrosive or scale-forming make-up water is introduced even in these systems, due to unavoidable leakage.

"Continuous and properly executed water treatment can prolong the life of air conditioning equipment many times over, as it has done to conventional water piping systems," Mr. Shuldener pointed out. "Proper maintenance is important because of the short length of the cooling season.

News of PEOPLE

CHARLES D. WATSON is being superseded as manager of the Glassboro Cold Storage Corp., Glassboro, N. J. by B. A. Mosey. Charlie will continue as vice-president and consultant. He expects to spend most of his winters at his Florida home (1207 Idlewild Drive, Clearwater, Fla.) where the welcome mat will be out for all his friends in the cold storage industry.—NARW Cold Facts.

Leonard Presented Distinguished Service Award

THE National Safety Council's distinguished service award for 1953 was presented to W. F. Leonard, Jr., safety director of the Southland Corporation, Dallas, at the recent convention of the Council in Chicago. Mr. Leonard also was voted the outstanding safety engineer of the council's food section for 1953. Presentation of the award was made by Gordon Morrison, safety director of the Kellogg Company, and chairman of the food section of the NSC. Mr. Leonard won outstanding recognition for his safety program for the 1500 employees of the Southland Corporation in Dallas, Fort Worth, Austin, Houston, Waco, Temple, Paris, Longview, Mineral Wells. He also is chairman of the ice and cold storage division of the food section of the National Safety Council.

WALTER L. FLEISCHER, New York, N. Y., has been nominated to receive the F. Paul Anderson Medal of The American Society of Heating and Ventilating Engineers for 1953 in recognition of outstanding contributions to the advancement of heating, ventilating and air conditioning in the field of human comfort, it was announced by Reg. F. Taylor, president of the Society. Formal presentation of the award will be made at the Society's 60th Annual Meeting in Houston, Tex., January 27, 1954.

Comfort conditioning has been Mr. Fleischer's primary interest since 1903 when he supervised the engineering of the ventilating system of the New Amsterdam Theatre. He later designed, supervised or installed the ventilating systems for the Shubert, Ames, Forty-Fourth Street, Fulton, Maxime-Elliot and dozens of others including theatres in Chicago, St. Louis, Newark and other cities. A life member of ASHVE he served as president in 1941, and was president of the New York chapter in 1920-21.

New Chicago Service Firm

FORMATION of a new sales, installation and service company, known as Polaraid, Inc., organized for the express purpose of serving the industrial and commercial refrigeration field in the process and food industries, was announced last month. Background of the owners, Jos. J. Lewen and Ralph Gotlund, covers many years of installations of refrigeration equipment. Headquarters for the new firm is at 1606 N. Meade Ave., Chicago 39.

Gordon Morrison, safety director of Kellogg Company, presents safety award to W. F. Leonard, Jr.

Correction

WE REGRET very much that in the December issue there was a transposition of half-tone cuts, showing George Bright presenting professor Venemann with a token of appreciation at the NAPRE convention; and E. B. Lehrack of Creamery Package Manufacturing Co. congratulating Otto P. Heller upon completing fifty years with the CP organization. Below are reproduced the two illustrations with the proper captions.

George B. Bright, Detroit, presents Professor Venemann with gold watch and band as a token of appreciation from the members of NAPRE. Mrs. Venemann and Bert C. McKenna, Chairman, Board of Directors, watch the proceedings. Mr. Bright startled banquet attendants by dropping the first package onto the floor. The first gift parcel proved to be a dummy.

E. B. Lehrack, left, President and General Manager, Creamery Package Mfg. Co., congratulates Otto P. Heller, Secretary, upon completing fifty years with the CP organization. Mr. Heller was the guest of honor at a luncheon given by the Creamery Package Board of Directors at the Union League Club.

DEATHS

Harry Hammond

THE death of Harry Hammond, executive vice-president of The Mutual Ice Company, Alexandria, Va., occurred November 23 following a brief illness, at the age of 80.

A native of Alexandria, Mr. Hammond was a pioneer in the growth of the city and was noted for his civic and charitable contributions. At an early age he joined his father, J. W. Hammond who operated an ice business in Alexandria, harvesting natural ice from the old canal that ran through the city, and having it shipped in from Maine. In 1900 the firm merged with the Reardon Ice Company to form the present day Mutual Ice Company. The company now is one of the largest truck icing concerns in the country.

Mr. Hammond was honored last August by members of the Kena Temple who recognized his 54 years of service as a Mason. He was a 32nd degree Mason. He was a member of the Alexandria Chamber of Commerce, past member of the school board, a director of the First National Bank, member of the Kiwanis Club, Sons of Confederate Veterans and the Methodist Episcopal Church South. He is survived by two daughters, a son, James D. Hammond, six grand children and five great grandchildren.

FRANK E. JEFFE, 70, a refrigeration engineer for ice-cream companies 43 years before he retired in 1949, died December 10, in Buffalo General Hospital. Mr. Jeffe started to work for the old Hoefler Ice Cream Co. in 1906 and stayed on the job when the company was taken over by the General Ice Cream Co. 30 years later. He was chief refrigeration engineer when he retired.

K. HERSCHEL PURDY, Tarrytown, N. Y., age sixty, Westchester and New Jersey regional manager of the Rubel Ice Co., died of a heart attack November 13. Mr. Purdy was former president of the Westchester Service Corp., who sold out to the Rubel Co. six year ago.

LOUIS NIEBERGALL, who has for the past 60 years operated the Niebergall Ice and Storage Company, Wheeling, West Virginia, died Thursday, November 5. He was 91. For many years also he operated the Louis Niebergall Meat Packing firm.

HARRY C. HUNT, chief refrigerating engineer for the Polar Service Company, Decatur, Ill., until he retired in 1944, died December 8, in the Illinois Masonic home in Sullivan where he had been living.

James J. Hughes

THE death of Commander James J. Hughes, president of the Terminal Refrigeration and Warehousing Corporation and the Consolidated Terminal Corporation, Washington, D.C., occurred November 24, 1953 at the age of 55. Commander Hughes was the Commander of the Naval Ship, Panay, when it was bombed in the Yangtse River in December 1937. He received the Navy & Marine Corps Medal for his action in saving the USS Electra during the assault on French Morocco during World War II in November 1942. He had been president of the Terminal since June 1945, after his retirement from active duty.

FRED S. ABEL, secretary of the Kansas Ice and Storage Company, Salina, Kansas, died November 23. He was 85. He was also vice-president of the Lee Hardware Company and a past president of the Rotary Club and Chamber of Commerce.

FRANK A. DATTOLE, 62, ice dealer for 30 years in Dallas, Tex. died October 23 at his home near Ennis, where he had moved after retiring in 1950. He had been associated with The Southern Ice Company prior to retirement.

ALBERT H. FOCKE, vice-president of The Terminal Cold Storage & Ice Company, Dayton, Ohio, died September 28 of a heart attack. Mr. Focke, who was 69 at the time of his death, was one of the founders of the firm.

K. H. PURDY, regional manager of the Rubel Ice Company at Tarrytown, N. Y., died November 13 of a heart attack. He was former president of the Westchester Service Corp., which sold out to the Rubel Ice Company six years ago.

HARRY CURRAN, 64 year old owner of the Economy Coal Co. Decatur, Ill., and formerly manager of City Products Co. plants in Decatur, died at the home of his son William, in Pattonsville, Mo., November 6.

MRS. C. W. DAWLEY, widow of the founder of the Southern Ice and Utilities Company, died December 2, at her home in San Antonio, where she had lived since her husband's death in 1935. She was 73.

WILLIAM HAGEDORN, age 77, who retired several years ago as president of Hagedorn Brothers, coal and ice dealers, died November 16. At the time of his death he resided at 404 W. 246th St., Bronx, N. Y.

BYRAM S. DICKERSON, 66, one of the founders of the Mansfield Frosted Foods, Inc., died Oct. 25 in Mansfield, Ohio where he moved in 1950 from Indianapolis.

MANUFACTURERS' NEWS

Kramer Salesmen Meet with Officials

PLANT officials of the Kramer Trenton Company, Trenton, N. J., manufacturers of air conditioning and refrigeration products, met with Kramer sales staff recently.

Plans for 1954 sales and new products were revealed at the sales meeting by plant officials, headed by Israel Kramer, one of the principals of the Kramer Trenton Company firm, and S. Charles Segal, general sales manager. Products receiving major attention included the patented Kramer "Figure 8 Surface" with its no-return-bend construction; the new Kramer "Winterstat", an inexpensive control which automatically maintains proper head pressures during the winter when used in conjunction with the Kramer "Unicon" remote type air-cooled condenser; and the new Kramer air conditioning unit featuring a "muggy air" control.

Kramer salesmen and plant officials at sales conference

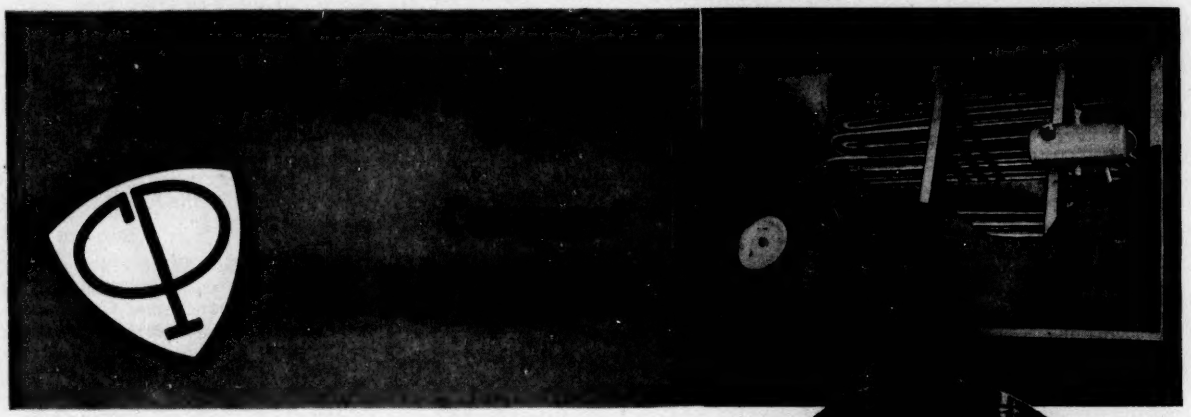
Thompson Represents Frick In Rocky Mountain States

ANNOUNCEMENT is made by Frick Company, of Waynesboro, Pa., that D. B. Thompson will be established at Denver as sales representative, beginning January 1, 1954.

D .B. Thompson

Mr. Thompson has had twenty years' experience in ice making, cold storage, refrigeration, and air conditioning work, and is thoroughly familiar with all types of Frick equipment. He will travel throughout the Rocky Mountain States, where he is already well known as a refrigerating engineer and consultant. He will be under the general direction of Van J. Sparks, manager of the Frick Branch Office at Kansas City.

Mr. Thompson for years was active in the Mountain States Ice Association.



A Flexible "Reservoir" of Refrigeration with "Sweet" (Chilled) Water

With a CP Compact Ice Builder you "make" low cost refrigeration during light-demand periods to use as you need during heavy-demand cycles. Ice built up on the coils of the Ice Builder melts down to 33° "sweet" water for plate coolers, tanks and other equipment. You can distribute this flexible "reservoir" of refrigeration to meet hour-to-hour needs—cut peak load electrical demands—and protect yourself against shutdowns. Capacities from 1000 lbs. up.

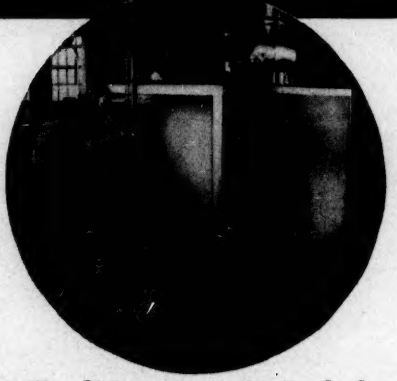
THE Creamery Package MFG. COMPANY

General and Export Offices: 1243 W. Washington Blvd., Chicago 7, Illinois

Sales Branches: Atlanta • Boston • Buffalo • Chicago • Dallas • Denver • Houston • Kansas City, Mo. Los Angeles • Minneapolis • Nashville • New York • Omaha • Philadelphia • Portland, Ore. • St. Louis Salt Lake City • San Francisco • Seattle – Toledo, Ohio • Waterloo, Ia.

CREAMERY PACKAGE MFG. CO. OF CANADA, LTD. 267 King St., West, Toronto 2, Ontario

THE CREAMERY PACKAGE MFG. CO., LTD. Mill Green Road, Mitcham Junction, Surrey, England



Let Your CP Representative Help You Cut Costs with CP Refrigeration

Armstrong Cork Announces Changes

After 38 years with the company, M. W. Cuskey, general credit manager of the Armstrong Cork Company, will retire on December 31. Warden N. Hartman, Jr., will succeed him. Mr. Hartman, now manager of the industrial insulation department of the building materials division, will be succeeded in that position by J. W. Liddell, Jr.

Mr. Cuskey joined the Armstrong organization in 1915 as a clerk and rose through the ranks. He has served in a credit management capacity since 1920 and is well known to many thousands of Armstrong customers throughout the nation.

Mr. Hartman, a graduate of the Massachusetts Institute of Technology, has been a member of the Armstrong organization since 1939. Liddell, at present manager of high temperature insulation products, joined the Armstrong organization in 1940. He is a graduate of Northwestern University.

M. W. Cuskey *Warden N. Hartman Jr.* *J. W. Liddell, Jr.*

The company also announced that Elvin R. Slaugh, who resigned from the credit department in 1949 will return to the company on December 1 as credit manager of the Floor and Industrial Divisions.

York Declares Dividend

DIRECTORS of York Corporation, York, Pa., have declared an extra dividend of 25 cents and the regular quarterly dividend of 25 cents. This brings 1953 payments to $1.25 against $1.00 in 1952.

Bulletin on Pumps

VERTICAL turbine pumps for the safe and efficient handling of all petroleum products and other volatile fluids are described in a new bulletin published by Layne & Bowler, Inc., Memphis, Tenn. Capacities of these pumps range from 40 gallons per minute to 4,000 gallons per minute, and more for special service requirements.

They are manufactured in two types. The Layne Standard pump has suction below grade and discharge above grade for pumping volatile fluids from underground storage tanks. The Layne Line-Flo pump, with both suction and discharge above grade, is for direct fuel transfer using minmum installation space.

Among their features are bearings made of either laminated plastic or high lead content bronze, fully enclosed impellers of phosphor gear bronze, and flared suction nozzle to reduce entrance velocity and eliminate swirls and eddies. Design of these Layne pumps virtually prevents vapor lock, a common trouble in pumping highly volatile fluids. Various special fittings and materials are available to make them adaptable to any kind of service.

Air Conditioning Catalog

A NEW air conditioning and refrigeration catalog, No. 98, a consolidation of several previous bulletins, has been published by McQuay Inc., Minneapolis, Minn. The catalog describes and illustrates unit coolers, tunnel freezers, cooling towers and other equipment. It also includes specifications and a considerable amount of engineering data and other information.

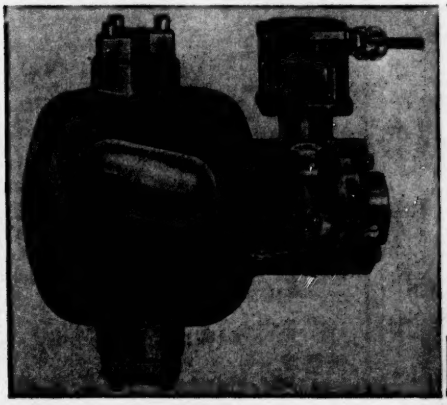
Bulletin on Automatic Time Switch

A NEW bulletin on heavy-duty time switches for automatic control of street lighting, store windows, signs, refrigerator defrosting, and many other industrial applications, has been announced as available from the General Electric Company, Schenectady 5, N.Y. The eight-page publication, GEC-535C, contains information on the design, operation, and application of the G-E Type T-27 time switch. Dimensions and pricing data also are provided.

CATALOGS AND BULLETINS

Folder on "Reeferite"

A FOUR-PAGE folder on "Reeferite," a new sheathing panel for the refrigerated spaces aboard all types of ships, has been issued by Johns-Manville. This new panel consists of two monolithic faces of J-M Marine Veneer (asbestos fiber and cement composition) with a core of aluminum. These are laminated into a strong, permanently bonded sheet. Reeferite is supplied in large sheets 4 x 8 feet and 4 x 7 feet to provide rapid coverage with a minimum number of joints.



the FLOAT SWITCH with the Picture Window

Mojonnier MS Float Switches have "Picture Window" sight glasses that provide an instant check on the refrigerant level, permitting fast trouble diagnosis, and often preventing costly "line check" shutdowns. Can be used on any accumulator or control, with any standard refrigerant. Switch operates on a new magnetic principle. All operating parts in transparent waterproof housing. Write for Bulletin 243.

MOJONNIER BROS. CO., 4601 W. OHIO ST., CHICAGO 44, ILL.

MS FLOAT SWITCH

Spray Nozzle Catalog

A COMPREHENSIVE industrial spray nozzle catalog, No. 24, has been issued by Spraying Systems Inc. Bellwood, Ill. It contains 48 pages. Thousands of standard and special industrial spray nozzles are illustrated and described. For each nozzle, complete data is listed covering capacity and spray angle. Dimensional specifications for all standard nozzles are also given. Because the information is so extensive, a new type of index was designed to assist the reader in finding desired data. Spray nozzles are indexed in terms of "Spray Patterns". The six main headings are "Hollow Cone, Full Cone, Square Spray, Flat Spray, Straight Stream and Air Atomizing."

In addition to spray nozzles, information is supplied on a wide variety of related equipment such as line strainers, elbows, check valves, and adjustable joints. For handy use by the engineer, tables are included on spray coverage and pipe frictions.

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Reports, Appraisals and Management

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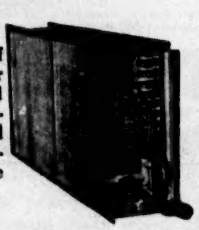

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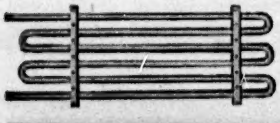

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Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings. $15.00 per line for line listings.

ICE PLANTS—for sale

FOR SALE—Going ice and coal business, in Mobile, Ala.—including trucks and equipment. 50 tons per day; have fine water. Write R. A. Sossaman, 900 S. Broad St., Mobile, Ala.

FOR SALE—COMPLETE ICE PLANTS
20 tons to 150 tons.
AMMONIA COMPRESSORS
10x10 York direct connected to 100 h.p. syn. motor.
9x9 Frick—V belt drive to 60 h.p. motor.
8x8 Frick—direct connected to 50 h.p. syn. motor.
7½x7½ York—V belt drive to 60 h.p. motor.
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3x3 and 4x4 self-contained units.
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Link-Belt crusher slinger with 10 h.p. motor.
4-cylinder Freon 12 compressor, V-belt drive, to 40 h.p. motor.
Type 100 F & E automatic cuber.
150 H.P. 3 cylinder Superior Diesel Engine 600 rpm.
50 h.p. motor 2300 volts—75 h.p. syn. motor 300 rpm.
75 h.p. motor 720 rpm—11½x22½x45" ice cans.
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JOHN F. CARSON
"A" & Venango Sts. Philadelphia 34, Pa.
Phone—GArfield 6-2221

USED EQUIPMENT—wanted & for sale

FOR SALE—One York compressor 10x10, with flywheel, belts and motor pulleys. Good condition. Price F.O.B. Springfield, Mass., as is, $400.00. Pioneer Valley Refrigerated Warehouse, Inc., Springfield, Mass.

FOR SALE—2 York 10x10 ammonia compressors. Still erected as last used; late model No. D8; with G.E. 100 h.p., 550 volt, synchronous motors, exciters, panelboards, all controls. Installed new in 1946; bargain price. Address Box JA-2, Industrial Refrigeration.

FOR SALE—3x3 self-contained York. 7½x7½, 8x8, 9x9 Yorks. 3 ton York flake ice maker. 10"x7" Worthington booster compressor. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE—York high and low speed 7½x7½ with motors, 9x9 high and slow speed with motors, 12x12 with motor, 6x6 high speed; self-contained units; ice cans; brine coolers; cranes; condensers; agitators; blowers. Parke Pettegrew & Son Company, 370 W. Broad St., Columbus 8, Ohio.

FOR SALE—One belt wheel for 9x9 York compressor Serial No. 14291 with pulleys and rope belts; Good as new: 1 flat roller tightener. Hynes Cold Storage & Locker Co., P.O. Box 566, Canon City, Colo.

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ENGINEERS
COMPLETE PLANT DESIGNS INCLUDING BUILDING AND EQUIPMENT
11 PARK PLACE NEW YORK 7, N. Y.

FOR SALE—Portable ice crusher slinger unit, Link-Belt Model No. 230 with gas engine wheels, nozzle and 10 ft. 4 in. diameter hose. People's Ice Company, 1054 Oswego Blvd., Syracuse, N. Y.

FOR SALE—9x9 and 10x10 Frick ammonia comp. in good condition, with or without on shaft 300 r.p.m., 4,000 volt synchronous motor. North Pole Ice Co., Clarksburg, W. Va.

FOR SALE—5½x5½ Lipman Compressor—just rebuilt. For complete details write Evergreen Fruit Farms, Warwick, New York.

WANTED—One used 6½x6½ or 7x7 ammonia compressor, complete with V belt drive, motor and starter for 220 V. 3 phase, 60 cycle. Patterson Freezer Corp., 1100 S. Division St., Salisbury, Maryland.

WANTED—Late model York or Frick 10x10 or equivalent duplex ammonia compressors, having cap. of 150-225 ton, preferably with synchronous motor, exciters, all controls. Give complete details, serial number, location and asking price in first letter, inasmuch as we are serious buyers. Write JA Box 4, Industrial Refrigeration.

CONDENSERS WANTED—We are looking for three or four shell and tube type condensers. Must be ASME, late model; give us complete details and prices F.O.B. truck. Address Box JA-3, Industrial Refrigeration.

WANTED—9x9 or 10x10 high speed ammonia compressor with force feed lubrication. Also 100 h.p. motor. Give make, price, age and condition in first letter. Address P.O. Box 85, Wichita Falls, Texas.

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30 ton Ice Plant 360-300 lb. Ice Cans—4 Can Pull—Diesel Driven
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2—3x3 Frick Type H	2—4x4 York Y-28
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8x8 York Y-26	8x8 York Y-28
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9x9 Frick type H capacity control D.C. 100 H.P. 300 RPM Syn. Motor
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10x10 York Y-16 D.C. 70 H.P. 180 RPM Syn. Motor
10x10 York Y-28 D.C. 100 H.P. 300 RPM Syn. Motor

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New Equipment — Continued

Plastic Pipes End Corrosion

NEW, lightweight rigid plastic pipe and slip-sleeve fittings which have strong resistance to chemical corrosion was shown for the first time at the Chemical Show, Convention Hall, Philadelphia, November 30 to December 4. Alpha Plastics Inc., manufacturers of this industrial plastic pipe, predicts the new pipe will be dubbed the "stainless steel" of the plastic pipe industry because it can be adapted to a wide variety of applications where corrosion from alkalies and acids is a problem.

The plastic pipe is made from polyvinyl chloride resin plastic specially produced by B. F. Goodrich Chemical Company. It is five times lighter than steel pipe of the same size, permitting ease of handling, storage and shipping, and is reported able to withstand the roughest treatment because of its high-impact characteristic.

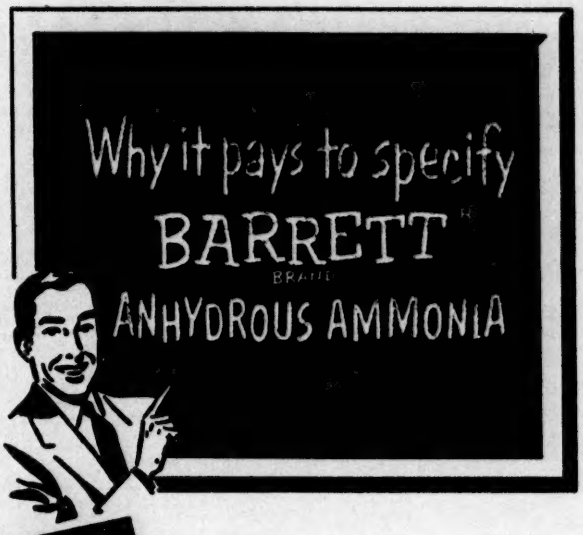
The new slip-sleeve fittings, Alpha says, are cemented to the pipe with a special solvent cement which is applied simply by brush, affording quicker installation. With this type fitting, the company says the connections are equal in strength to any other part of the pipe. In cost, the plastic pipe is considerably less expensive than corrosion resistant metal pipe. Alpha points out that industrial stainless steel pipe comparable to the same size plastic pipe would cost $2.24 per foot, while the plastic pipe would cost only 51 cents per foot.

Lady demonstrator saws new plastic pipe.

New Adjustable V-Belt For D and E Drives

A NEW Veelos adjustable v-belt for D and E drives is now in production by the Manheim Manufacturing & Belting Co., Manheim, Pa. Known as TD and TE, it is claimed to be the easiest v-belt to couple and uncouple ever made. It has been under development for more than five years and field tested in actual industry since January, 1950.

Veelos TD and TE link v-belts are made of plys of especially treated high-tensile strength canvas duck, joined by riveted studs with removable cup-washers and T-screws. This construction gives greater strength and durability at all key points yet enables the belts to be coupled and uncoupled easily. With all its greater strength and ease of installation, Veelos TD and TE v-belts are said to provide maximum flexibility to last longer, run cooler and smoother. Two types are available: regular rubber coated for general services and oil-proof for oily and high temperature drives.



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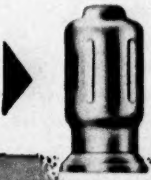
For greater savings, better service and better performance, specify Barrett® Anhydrous Ammonia—the brand with the bright green cylinder caps.



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Course Objectives: To determine the types of cooling and freezing equipment to be used for various food products.

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Equipment: One Vilter VMC 4-cylinder booster compressor, two Vilter vertical twin cylinder compressors. Evaporators range from bare pipe coils, to ceiling type blower units, to floor mounted blower units, to fin coils, to plate type coils, according to food to be cooled. Evaporators controlled by various means, including float valves, using accumulators, some flooded with thermal expansion valves, and some with thermostatic expansion valves.

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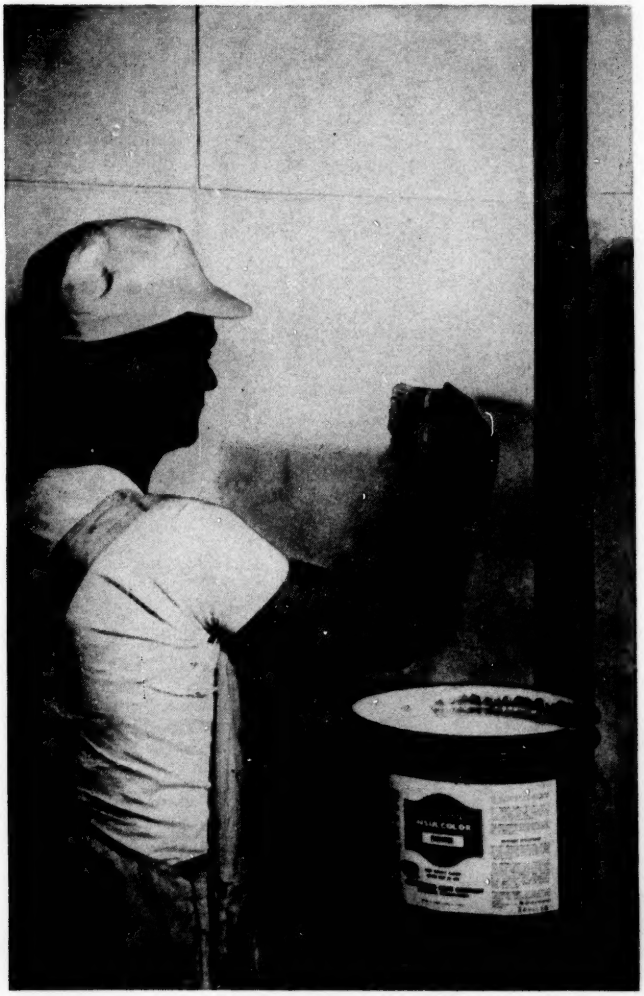
INTRODUCING

Armstrong's Insulcolor

A washable, plastic, cold-room finish that won't crack, shrink, or craze



Now you can have bright, sanitary cold-room interiors that are easy to clean—that stay fresh and attractive year after year! Armstrong's Insulcolor—available in white and seven colors—is a newly developed plastic coating for use in low-temperature rooms. Completely washable, it bonds firmly to portland cement plaster, asphalt emulsion, and bare corkboard surfaces. Low temperatures have no harmful effects on Insulcolor. This finish will hold up as long as the base to which it's applied.

SAFE TO USE. There are no inflammable solvents in Insulcolor, so fire hazard is eliminated during application. Wet or dry, Insulcolor is completely fire-resistant.

EASY TO CLEAN. Dust, dirt, grease, and soot can be readily washed off Insulcolor's smooth surface. A single Insulcolor application lasts many years without recoating.

USE INDOORS OR OUTDOORS. Highly resistant to water and surface damage, Insulcolor can be used over outdoor piping and equipment, as well as in indoor applications.

FOR FREE BOOKLET—describing the use and application of Insulcolor—call your nearest Armstrong office or write to Armstrong Cork Company, 2501 Skye Drive, Lancaster, Pennsylvania.

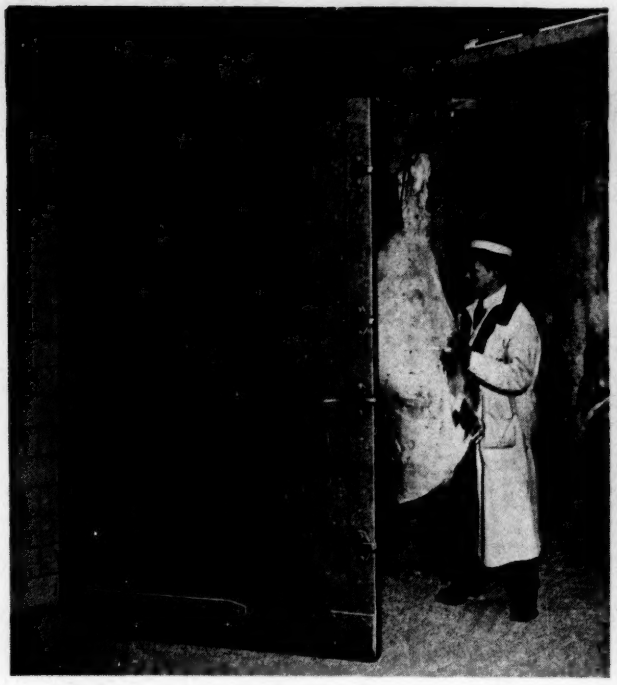
Easy to Apply. Insulcolor is quickly applied to insulation with either brush or spray gun. On most materials, two coats form a strong, protective film.

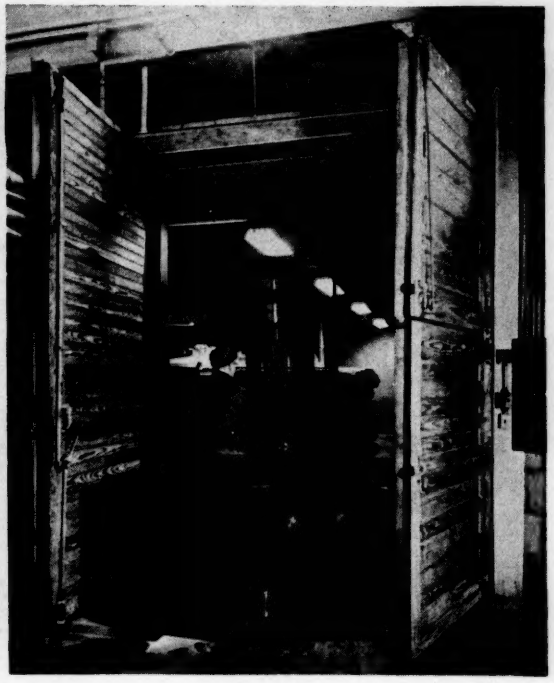
INSULCOLOR IS AVAILABLE IN THESE COLORS:
white - dark and light blue - dark and light green - buff - yellow - gray

NEW INSULCOLOR PROTECTS AND IDENTIFIES INSULATED COLD AND HOT LINES, DUCTS, TANKS

Identification of brine, cold-water, steam, and other lines has usually been by stenciled words or painted colors, applied after the finish was dry. Now, with Armstrong's Insulcolor, you get color identification and insulation finish in one application.

ARMSTRONG'S INSULCOLOR





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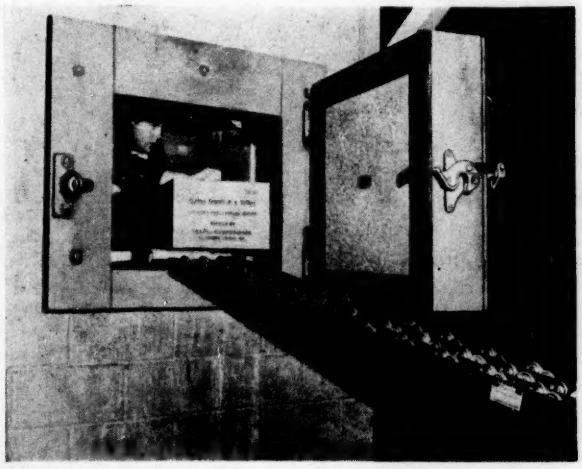
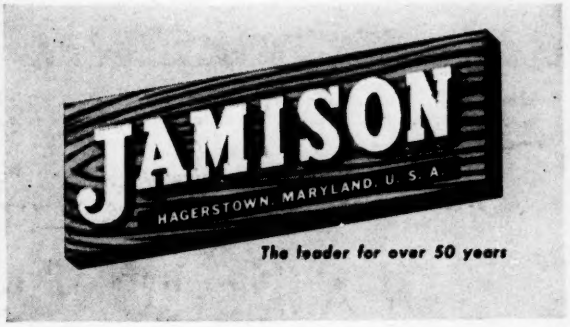
Warehouses, meat packers, food processors all agree that JAMISON Doors look better, work better, last longer . . . you will, too.